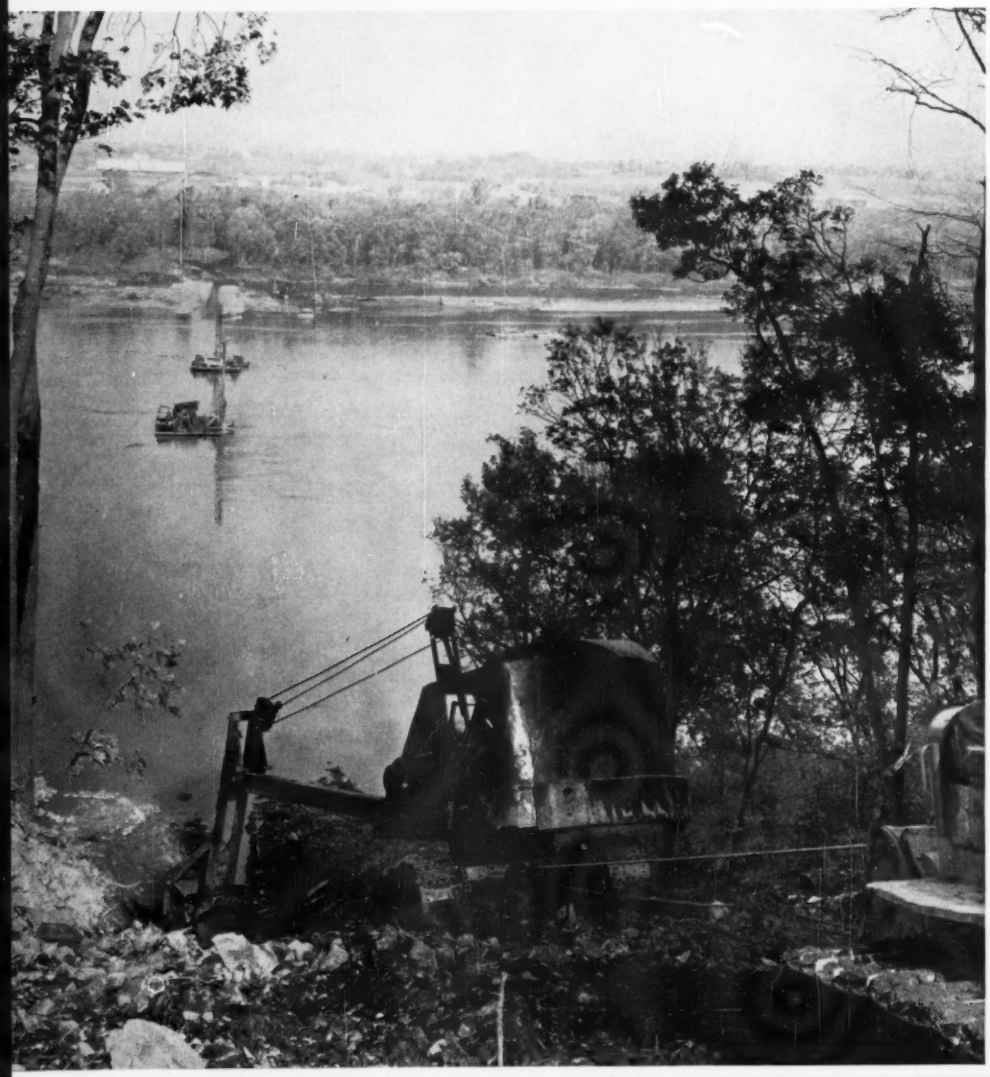
# Compressed Air Magazine

JANUARY 1955



HARBINGERS OF GAS PIPE LINE

Land machines and drill boats join forces at Susquehanna River

(SEE INDEX PAGE)

PHOTOGRAPH BY H. V. EISENHAUER

VOLUME 60 • NUMBER 1 NEW YORK • LONDON

# Air Casualties

***It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.***

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

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**BLUE RIBBON BLOWERS**

***THE BLOWERS THAT PUT MORE MINUTES IN EVERY MAN-HOUR***

**CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU**

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- ☐ in underground cable manholes.
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- ☐ on steam-heated rubber processes.
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- ☐ around cracking stills.
- ☐ exhausting welding fumes.
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- ☐ drying of walls, sheets, etc., after treated with coating material.

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# STAYNEW

## INTAKE FILTERS ASSURE ABRASIVE-FREE AIR

for the Ingersoll-Rand QUARRYMASTER*

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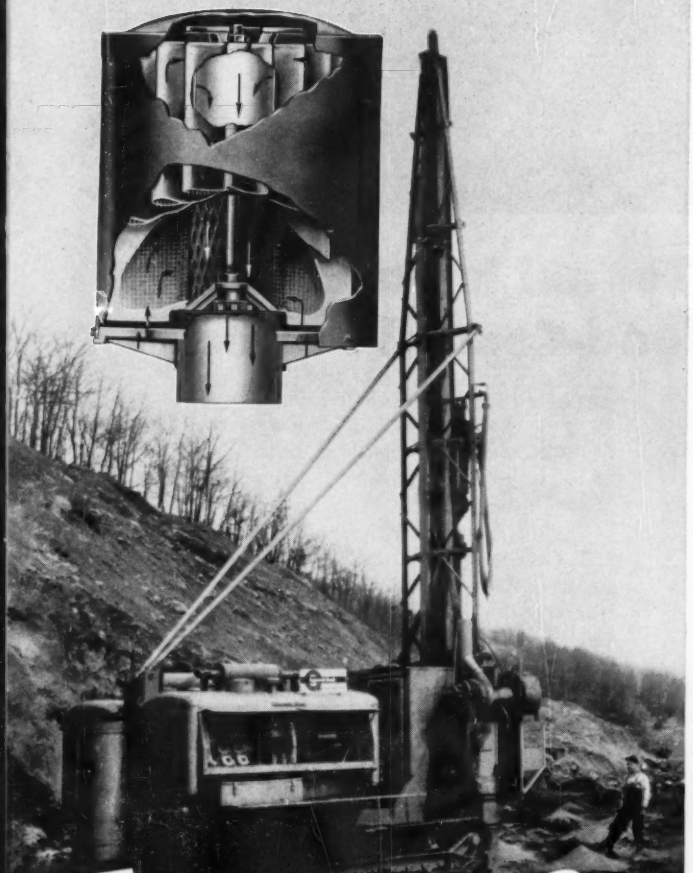
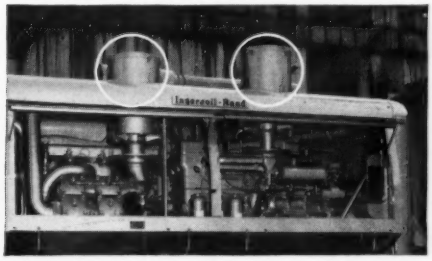


Staynew Filter's "positive protection" minimizes wear, keeps equipment at top efficiency longer. They are efficient over a wide range of loads and not affected by temperature changes. Dry-type filtering media removes dust particles without viscous or oily filter aids. There's no oil carry-over . . . no need for carefully held maintenance schedules. Staynew Intake Filters are easy to clean on the job.

When your air compressing equipment demands the protection Staynew Intake Filters are designed to give, specify . . . and get . . . Staynew.

**CLOSE-UP** of two of the four Staynew Model D Intake Filters at work protecting air intakes on an Ingersoll-Rand Quarrymaster.



*The Ingersoll-Rand Quarrymaster is a self-contained primary blast hole rig complete with drill, power plant, propulsion elements and auxiliary equipment, all mounted on tractor treads. Operating in quarries and large construction jobs in extremely dusty locations—clean intake air is a must for the diesel engine, compressor and various air motors comprising the unit. A continuous supply of abrasive-free intake air is assured by four Staynew Model D Intake Filters on every Quarrymaster.

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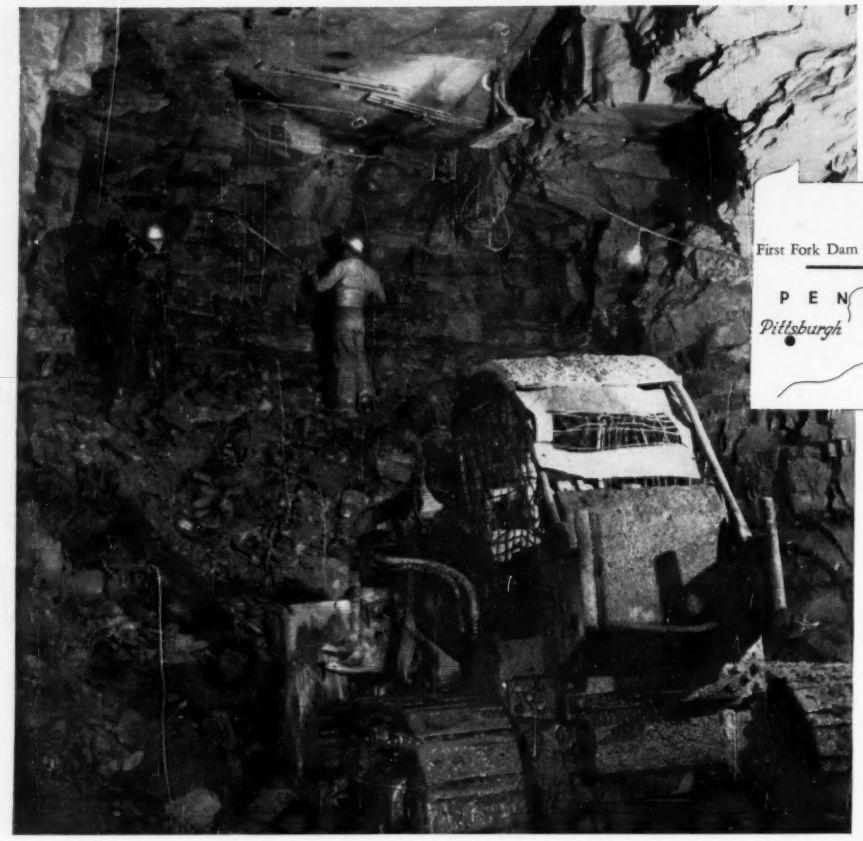
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED



Location of First Fork Dam at Sinnemahoning, Pa. This important flood-control project is being built by General State Authority of the Commonwealth of Pennsylvania.

Interior view of 1150-ft diversion tunnel. Workers are chipping off the loose rock, preparatory to mucking out. Bethlehem Hollow Drill Steel was used in making the 20-ft bore. For greater safety, Bethlehem Roof Bolts were driven into rock in tunnel roof.

# New 1150-ft Tunnel is Part of Pennsylvania Flood-Control Project

One of the most ambitious flood-control projects yet attempted by the General State Authority of the Commonwealth of Pennsylvania is now underway on the First Fork Sinnemahoning Creek. The project is called the First Fork Dam. It is aimed at alleviating damage caused by floods on the West Branch of the Susquehanna River, in Cameron and Potter Counties.

Upon completion in 1956, the 1650-ft long dam will have a 170-ft-high stone and earth embankment, and a 210-ft-high concrete intake structure.

Part of the project is a diversion and water-control tunnel, hewn through solid rock in an adjacent mountainside. This subterranean channel, now in operation, diverts the First Fork Sinnemahoning Creek. It has a two-fold purpose—facilitating the closing of a gap in the breastwork of the dam, and providing for the normal flow of the stream.

The tunnel consists of a 20-ft-diameter bore, 1150 ft long. After lining with concrete, its finished diameter was 16 ft. Construction of the tunnel necessitated the removal of 14,500 cu yd of medium-hard and abrasive grey sandstone and red shale.

The sub-contractor for the tunnel, Lewis and Bowman, Inc., Goldsboro, N. C., used a large quantity of 1 in. hexagon Bethlehem Hollow Drill Steel, fitted with carbide-insert bits. The rock footage drilled by stopers, drifters and jumbos was approximately 55,000 ft. Blast holes were 10 ft deep. Reconditioning was done by Howells Mining Drill Company, Plymouth, Pa. Prime contractor for the project was Nello L. Teer Company, Durham, N. C.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

**Two Grades of**

## BETHLEHEM HOLLOW DRILL STEEL

**CARBON • ULTRA-ALLOY (chrome moly)**

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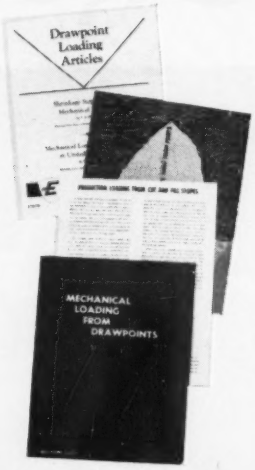


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Drawpoints can, with few exceptions, be used in any mining system. This economical production method is gaining in popularity and has numerous advantages in lower costs, higher production and greater safety.

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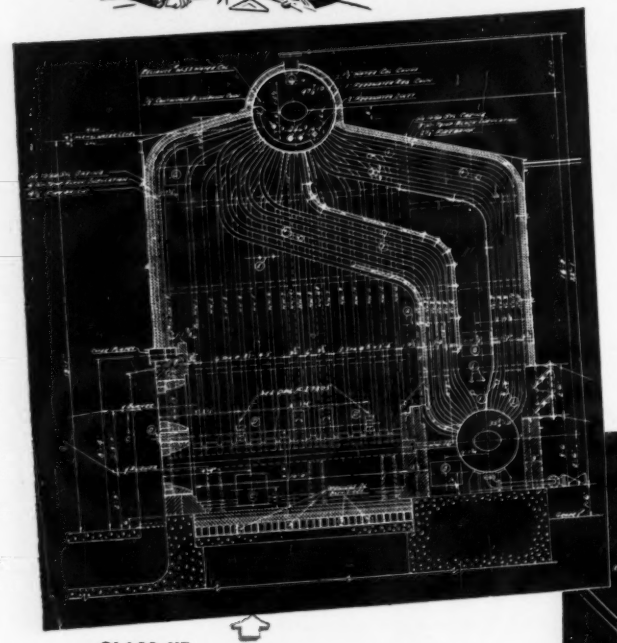
# Industry Approved

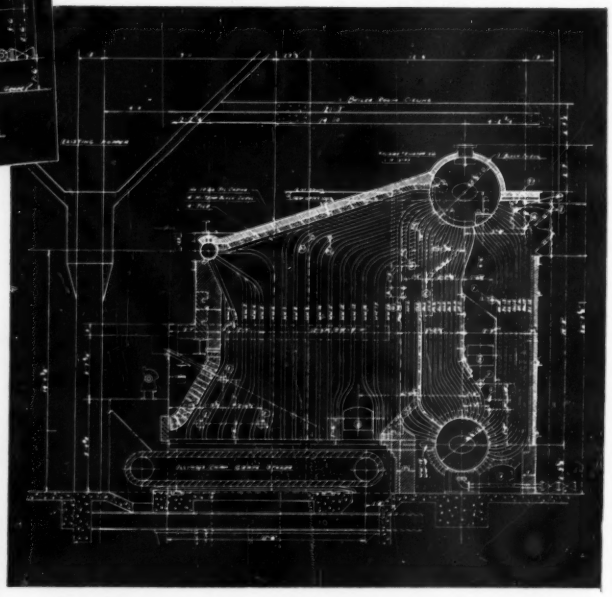
# *Two-Drum*

## STEAM GENERATORS

## by Vogt



**CLASS VF**
A 22,000 pounds steam per hour unit installed at Indiana Farm Bureau Refinery, Mt. Vernon, Ind.



**CLASS VS**
The Seelbach Hotel, Louisville, Ky. is served by this 30,000 pounds steam per hour boiler.

A wide variety of industrial plants and other users of steam for power, processing, or heating have found these efficient Vogt Two-Drum Type Boilers to be the answer to their diverse steam generating requirements.

Class VF units provide maximum capacity in limited floor space and head room, while Class VS is best adapted to installations not having such restrictions. Each has a large furnace volume and a high ratio of radiant heating surface. The furnace design assures proper combustion of fuels fired in suspension or with various type of stokers.

*A bulletin with general information and showing typical installations is available on request.*

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**AIR engineering at work**
**REPORT No. 4400.05**

# *Running Ten Nuts at a Crack...*

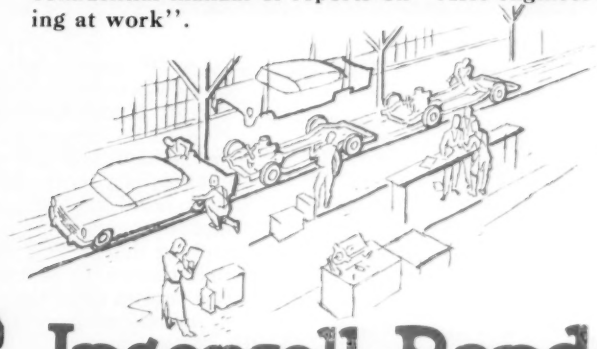
## SAVES $12,000 *a year!*

This large auto manufacturer formerly used two ¼ ton presses to position a differential carrier in the rear axle housing. Then the ten ⅜" nuts were run individually. Only experienced operators could control torque so that it met specifications. Naturally the engineers wanted to eliminate the press operation and improve torque control.

AIR engineering by Ingersoll-Rand provided the answer and saved $12,000 a year. A 10-Spindle Multiple Nut Runner is now suspended over the moving conveyor. The differential carrier is hand set on the housing, and dropped to within ⅛" of its final location. The 10-spindle nut runner quickly and accurately draws it into final position as it runs all 10 nuts at once . . . and to the required 50 ft. lbs. torque. The press operation is eliminated, and simultaneous running of the nuts eliminates binding.

If you are in any way responsible for cutting costs in your plant, write us on your company letterhead, and we will arrange for you to see I-R's confidential manual of reports on "AIR engineering at work".

Ingersoll-Rand Multiple Nut Runner runs 10 nuts at once, all to exact torque.



**Ingersoll-Rand**

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**AIR engineering Manual**

Don't miss over 100 interesting case history applications of AIR engineering in this confidential manual.

8-147

# drilling for 400,000

# KW of electricity...

Some 200 miles north of Sao Paulo, Brazil, Ebasco Services is engineering and constructing the Peixoto Hydro Electric Development, for Cia. Paulista de Forca e Luz. When completed, the harnessed waters of the Rio Grande will furnish 400,000 KW of electricity for the industrial development of the area.

To build the dam and accessways to it, meant moving many hundred tons of earth and rock — and for that big job Crucible Hollow Drill Rods were chosen. Experienced construction men *know* they can depend upon these rods for *optimum* performance *at lowest cost per foot of hole drilled.*

That's because Crucible Hollow Drill Rods are built to *tool steel* standards, by the leading producer of tool and special purpose steels. That means fewer broken rods or valuable bits lost on the job. So be sure that on your drilling jobs you specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

# Again in 1955

The parade of a-c motors started in May 1, 1888 when Nikola Tesla was granted his patent on the fundamentals of the polyphase induction motor. From that day on, Westinghouse has pioneered each step ahead in the design of a-c motors.

Now, Westinghouse takes another big step ahead . . . the new Life-Line® "A" motor.

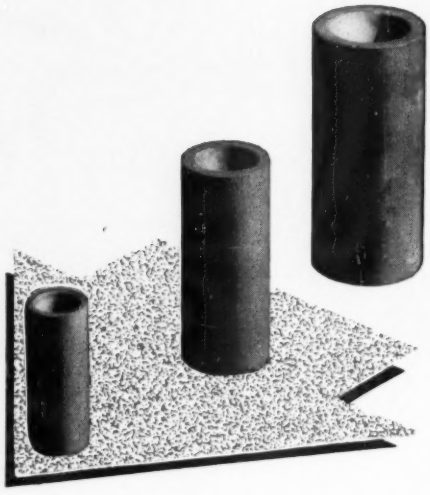
Here is an industrial motor that provides: lower maintenance costs—fewer motor outages—longer motor life—fewer application restrictions—smoother, quieter operation—consistent performance—greater protection. Is your plant taking advantage of all these benefits? Try a test installation and make your own comparison. J-21836-A

YOU CAN BE **SURE**...IF IT'S

**Westinghouse**

*Leading Foundries Use...*

# NORBIDE® Nozzles



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- They get more service per dollar cost (750 hours silica sand — 1500 hours steel shot or grit). NORTON guarantees this minimum service.
- Their air consumption is reduced from 10 to 20 per cent as compared with iron nozzles.
- They maintain stream contour and abrasive velocity.

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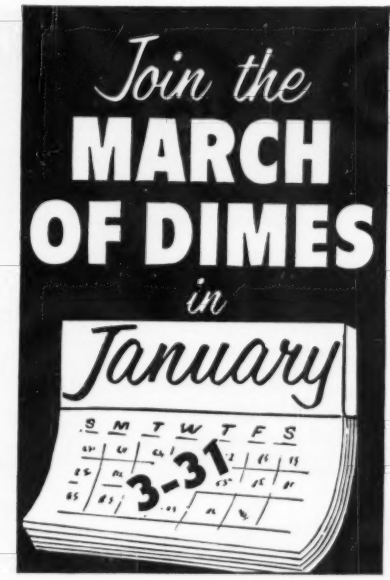


### ON THE COVER

WHERE a new gas pipe line is being laid across the Susquehanna River about 2 miles upstream from Marietta, Pa., the west bank of the stream rises abruptly for at least 150 feet. It is so steep, in fact, that a backhoe with which the contractor was attempting to dig a trench in the rocky declivity was kept from pitching downward only because it was held by a cable extending back to two bulldozers hooked up in tandem.

To get our cover picture, photographer Harold Eisenhauer waded ashore (in November) from a power boat that hit bottom a few yards from dry land, climbed the steep slope carrying his box-type 8x10-inch camera and tripod and set them up so as to frame the two drill barges in the river through the trees, with the backhoe in the foreground. Watching him from a boat below, Boss Al Sumrall of the pipelining crew remarked, "That fellow must really like to take pictures."

### IN THIS ISSUE

THE leading article—*Baking Our Daily Bread*—chronicles some of the many changes the process has undergone since the days when all housewives did their own baking. The bigger the bakery, the more it uses compressed air.

PUTTING down large-size blastholes in the rocky bed of a 1200-foot-wide river through up to 15 feet of fast-flowing water at the rate of more than one per hour, Missouri Valley Dredging Company did the trenching for a pipe line in unusually fast time. Page 10.

A FOURTEEN-TON air compressor that performed faithfully for 45 years recently came to the end of the road because the plant it was serving was discontinued. Page 16.


# Compressed Air Magazine



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## EDITORIAL CONTENTS


Baking Our Daily Bread—*R. J. Nemmers* . . . . . 2
Ancient Air Gun . . . . . 9
New Tricks for Submarine Drills—*C. H. Vivian* . . . . . 10
The Dayton Malleable Iron Company—*Allen S. Park* . . . . . 16
Editorials—Fat Man's Folly—Diversified Industry . . . . . 19
Signs That Glow in Daylight . . . . . 20
Sonics and Electronics Serve to Blend Fuel Oils . . . . . 21
Industrial Notes . . . . . 23
Quotes from Here and There . . . . . 29
Books and Industrial Literature . . . . . 31


## ADVERTISING CONTENTS


Air-Maze Corporation . . . . . 15
Bearium Metals Corp. . . . . 26
Bethlehem Steel Company . . . . . 4
Bucyrus-Erie Company . . . . . 28
Compressed Air Magazine Co. . . . . 26
Continental Motors Corp. . . . . 20
Coppus Engineering Corp. Second Cover
Crucible Steel Co. of America . . . . 8
Dollinger Corporation . . . . . 3
Eimco Corporation . . . . . 5
Galland-Henning Mfg. Co. . . . . 24
Garlock Packing Company, The . . 21
Gerotor May Corporation . . . . . 16
Goodall Rubber Company . . . . . 25
Hannifin Corporation . . . . . 26
Ingersoll-Rand Company . . 7, 23, 26, 27, 3rd Cover
Kewanee-Ross Corporation . . . . . 11
Lehigh, Inc. . . . . 13
Naylor Pipe Company . . . . . 22
New Jersey Meter . . . . . 25
Niagara Blower Company . . . . . 17
Norton Company . . . . . 10
Sarco Company . . . . . 24
Sauerman Bros., Inc. . . . . 14
Square D Company . . . . . 24
Texas Company . . . . . Back Cover
Toledo Pipe Threading Machine Co., The . . . . . 19
Victaulic Co. of America . . . . . 18
Vogt Machine Co., Henry . . . . . 6
Walworth Company . . . . . 29
Westinghouse Electric Corp. . . . . 9
Wisconsin Motor Corporation . . . . 12



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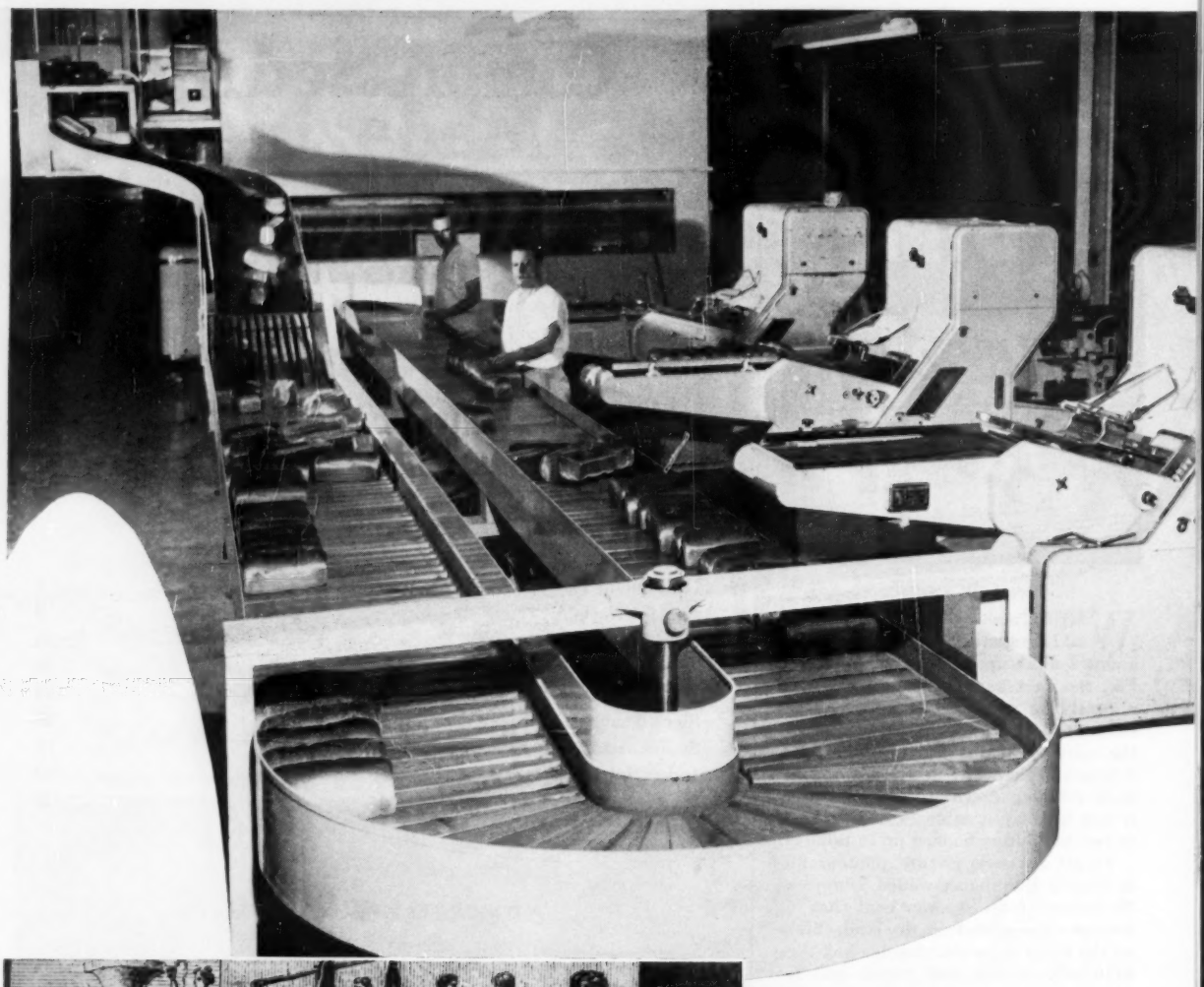


BETTMANN ARCHIVE PRINT

**BAKING 1800 YEARS AGO**

A wall mural found under the volcanic ashes that covered the ancient city of Pompeii. Phases of the bread-making process illustrated are, left to right: top– milling wheat, weighing loaves, selling and delivering; bottom– mixing dough and baking. Loaves of bread found in the ruins were stamped with the maker's name, presumably a requirement of that day to fix responsibility for purity and correct weight.

# *Baking Our*

**Modern Equipment, Some of It Pneumatic, Has Speeded Up an Old Process**

**R. J. Nemmers**

BREAD is the most common of all foods. It is served with a 10-course meal at the Ritz and a blue-plate special at Joe's diner — it is found on a millionaire's table as well as on that of the least of his clerks. Even the most incorrigible prisoner in solitary confinement is allotted a daily bread ration. It is inexpensive—a 1-pound loaf sells for about 20 to 25 cents in the United States —and the average worker can earn eight loaves in a little more than an hour. And nowadays purchased bread is of outstanding purity and wholesomeness.

**THE GOLDEN HARVEST**

After passing through the cooler, bread produced at Maier's Bakery slides down the ramp at the left onto a wooden-slat conveyor. The loaves are then carried around until they are picked up and fed into one of the three slicing and wrapping machines at the right.

**CAKE-PAN GREASER**

As each pan passes through the machine from right to left, it receives a light coating of oil from small pneumatic spray guns located under the hood. A considerable volume of air is required for this purpose and is furnished by an Ingersoll-Rand 10-hp compressor.

# r *Daily Bread*

It takes a big and complex industry to provide millions of American families with fresh baked goods. We have nearly 24,000 bakeries employing some 275,000 persons in baking and distributing bread and allied products. The annual payroll amounts to about $750 million, and the process of production adds more than a billion dollars yearly to the value of the raw materials used. The combined annual sales of these plants in recent years have been slightly over the 5-billion-dollar mark. As in many other industries, however, more than 90 percent of that total is grossed by only a few—around 35 percent—of the firms. The growth of the latter group came about through mass production and distribution methods, and it is with the more striking examples of mechanization and automation in modern bakeries that this article is chiefly concerned. But this does not imply that the small 1- or 2-employee bakery is on the way out, for there will always be a demand for specialties that cannot be made economically by machines.

The aim of bakers is a completely automatic plant where uniformity and high production can be regularly maintained. High quality is, of course, a requisite, because the concern that does not turn out tasty goods will not have to worry very long about production—it won't be able to sell what it bakes. Automation and mechanization are merely the tools that make uniformity possible—that enable a given set of conditions to be repeated exactly time after time. The important thing is to find the best formula to "plug into" the machines. Even in this the baker is aided by the laboratory chemist and physicist who determine for him such matters as relative texture and freshness of varying doughs and certain qualities pertaining to palatability.

Baking is one of man's most ancient crafts. At first the principal ingredient was not flour but crudely crushed nuts or grains which were combined with water and left to "bake" in the sun or, judging from calcined remains of patties found in stone-age dwellings, on convex stones. The latter, some of which also have been unearthed, were most likely heated by underfiring and heaping hot ashes on top.

According to most authorities, however, baking as we know it dates back to the early days of Egyptian culture because it was probably along the Nile River that the practice of leavening bread began. Some archaeologists are of the opinion that the method was much like that used by the Alaskan pioneers in making sour dough, which gave them the nickname "sourdoughs." And it was in Egypt that baking first became an established trade with masters, journeymen and apprentices. The quality of the bread was exceedingly high, as evidenced by fine-textured loaves of white bread found in the later pyramids and by some that closely resemble Vienna bread, even to the seeds sprinkled on the crust.

When the Egyptians started to bake raised bread they found that only one grain, wheat, lent itself to the process. Today we know the reason for this: wheat alone contains sufficient glutamine—the substance that converts into gluten which makes dough elastic and enables it to hold the bubbles of gas caused by fermentation. The bakers, however, gave credit for the manifestation to beneficent gods and relegated the other grains (oats, barley, etc.) to an inferior status; they were used only for feeding slaves, criminals and animals.

The ancients always attached a great deal of religious significance to the har-

vest, and it was only natural that it should enter into the baking of bread and the preparation of other foodstuffs. When it was found that dough left standing overnight actually grew in size and made a fine-textured and better-tasting product it was obvious to all that the gods were at work. In certain sections priests attended the "birth" of bread, and it is believed that each oven was sanctified before or during the baking of the first loaves.

Later the Hebrews learned that leavened bread was made from nothing more nor less than "spoiled" (fermented) dough, and that, too, figured prominently in their religion. Nearly all early peoples considered defilement of bread or, in extreme cases, of any food, sinful. Even seemingly innocuous acts were sometimes construed to be "bread-sins," and there were many of these as late as the Renaissance. Present-day etiquette dictates that bread should be broken, not cut, and this likewise is deeply rooted in old religious beliefs.

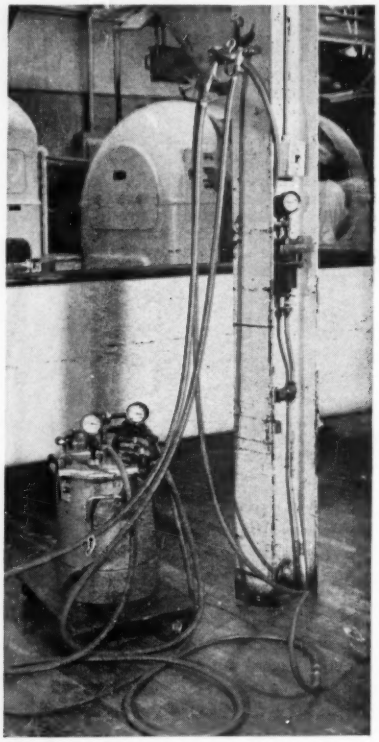
Throughout all literature there is frequent reference to bread, which leaves no doubt that that one word encompassed all foods. This probably stems from ancient Egypt, because in that largely agrarian society bread was the basic food and signified wealth and position. The average citizen received three "breads" and two flagons of beer for a day's labor, while a man who had distinguished himself in the eyes of the Pharaoh might be rewarded with 500 loaves and 100 jugs of beer.

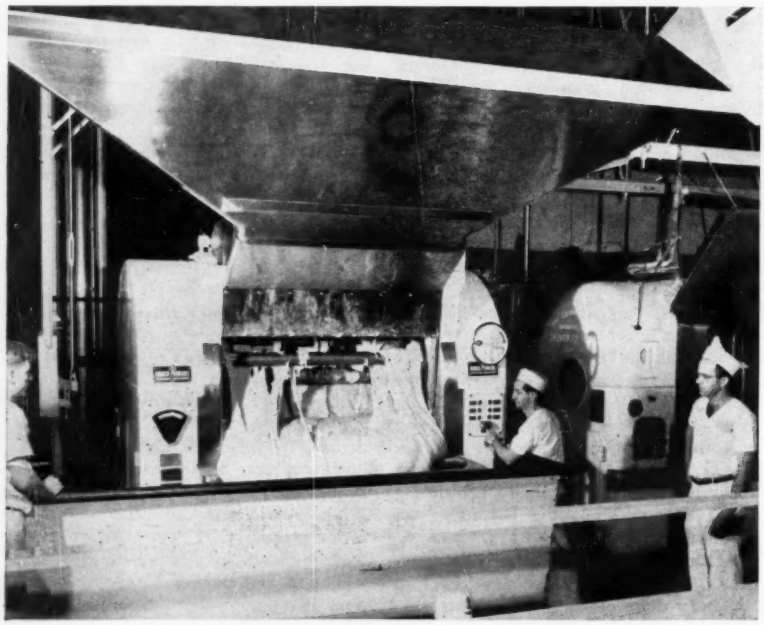
Because baking vitally concerns most of us, it is perhaps natural that the industry was one of the first to be regulated by governmental action: weight, price and purity all came under state and city laws as early as the first century A.D. Penalties for "baking crimes" ranged from fines and sometimes corporal punishment for selling underweight loaves to forcing the master and his apprentices to digest the bread that was polluted or adulterated. (Oftimes if it didn't kill them their demise was brought about by other means.) Under the volcanic ash which covered old Pompeii have been found loaves stamped with the maker's name, presumably to fix responsibility for weight and purity. But several centuries ago in Turkey the lot of even good bakers was the hardest. It is said that when the cost of bread got too high authorities merely hanged one or two bakers at random as a warning to others to reduce their prices.

Down through the years bread baking has remained much the same—the baker of today is doing about what his counterpart did 2000 years ago. To be sure, mixing machines and traveling ovens have taken the place of hands and convex stones, while flavorings, preservatives and even vitamin concentrates have been added to old recipes. The bread we now eat certainly is far more pure and wholesome than it once was, and instead of being handed a hard-crusted unwrapped loaf from a store shelf, we buy it sealed in sanitary waxed paper or cellophane. The generally high quality of today's baked goods has come about largely through the use of machinery, which also has made possible mass production and distribution.

The first significant time- and labor-saving device in the industry was introduced in France in the middle of the eighteenth century. It was a mechanical mixer—the first of its kind to duplicate the kneading action of human hands. It was designed on the same principle as present-day mixers, the dough being kneaded in a cylindrical chamber by arms of the same radius as the interior and revolving at moderate speed. The mass is rolled over and over, stretched, flipped and otherwise mixed far more thoroughly than any baker can knead it.

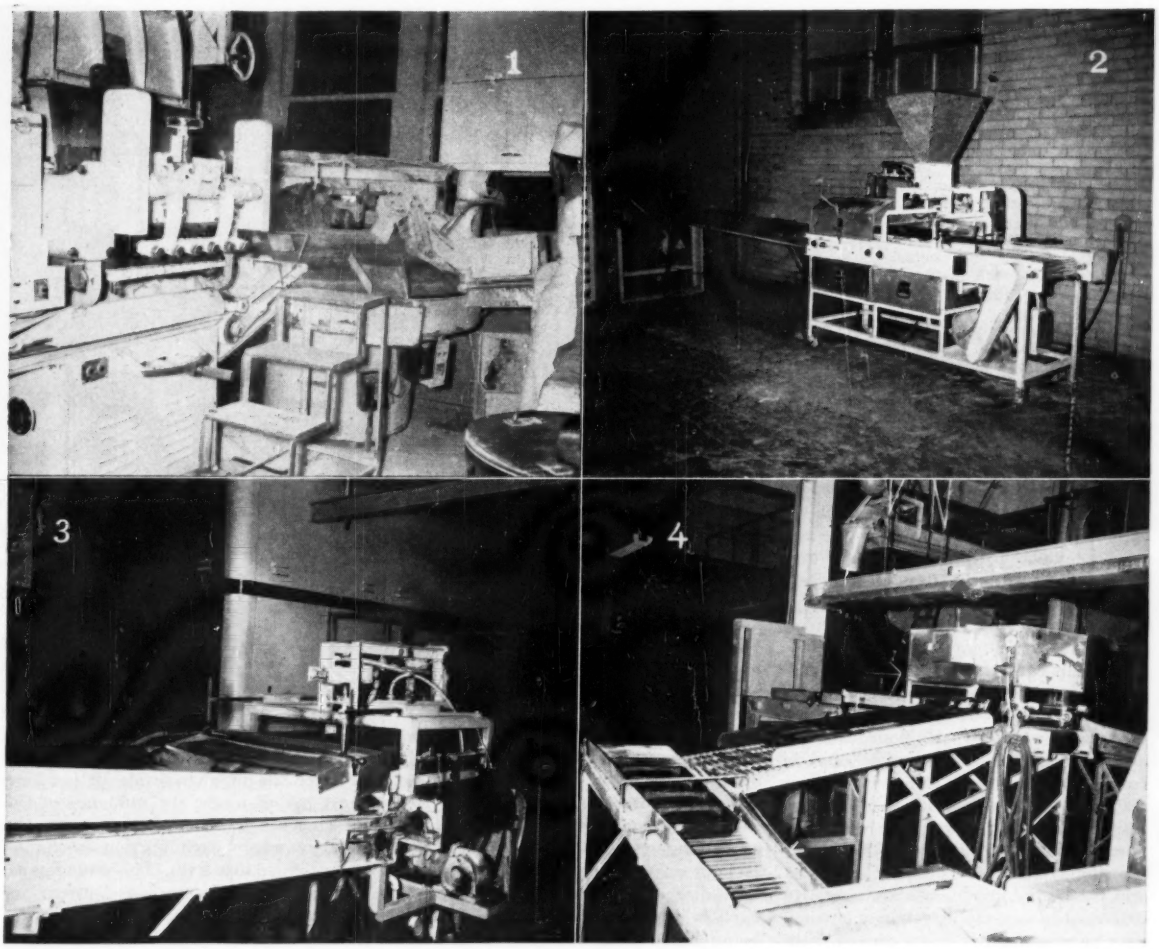
The next advance, nearly a century later, involved ovens which up to that time had been direct fired somewhat like an open vessel. The new type was steam heated; a closed system of tubes, filled with water, connecting the oven with a furnace. The superheated steam thus generated made it possible to maintain temperatures of 450 to 500°F. Units of this type provided steadier and more easily controlled heat and also could be made much larger without danger of cold spots. Subsequent developments led to the modern traveling type through





**MIXING BREAD DOUGH**

The dough mixer shown at the left is discharging a fully kneaded batch into a trough. The dough is clinging to one of the mechanical arms that take the place of human hands in the kneading process. To prevent the dough from sticking to the troughs (frequently pronounced "trows" by bakers) they are quickly greased by means of compressed-air guns like those hanging on the column above. The pictures were taken in Maier's Bakery, Reading, Pa.




**SOME STEPS IN BREAD MAKING**

1 DOUGH DIVIDER and "rounder-up." Dough is extruded, six lumps at a time, by pistons, the driving mechanism of which can be seen just left of the center. A conveyor carries the lumps to a rapidly revolving turntable (center) where they are formed into balls. After remaining ten minutes in an intermediate proofer they are molded into loaves and dropped into pans.

2 SESAME SEEDER. This air-powered device puts the little seeds on certain kinds of bread. The unit first sprays the loaves with water to make the surface slightly sticky and then sprinkles on the seeds.

3 SHARP TURN. A simple pneumatic cylinder saves space and equipment in this transfer operation. "Straps" of pans containing baked loaves travel a conveyor belt that meets the one shown at a right angle. Near the junction (far right) each group of pans strikes a quick-opening valve and actuates the cylinder which pushes the strap onto the belt in the foreground. Pans thus make a sharp turn without following a wide sweep or taking a drop that would otherwise be necessary.

4 DOUBLE DEALER. This device alternately diverts pans from a central conveyor to one or the other on opposite sides of it. In this manner steady streams of pans are delivered to two loaf formers. These pictures were taken in Schaible's Bakery, Easton, Pa., which developed this machine and the ones shown in Nos. 2 and 3.

which conveyors carry loaves in cycles precisely timed to bake them to perfection.

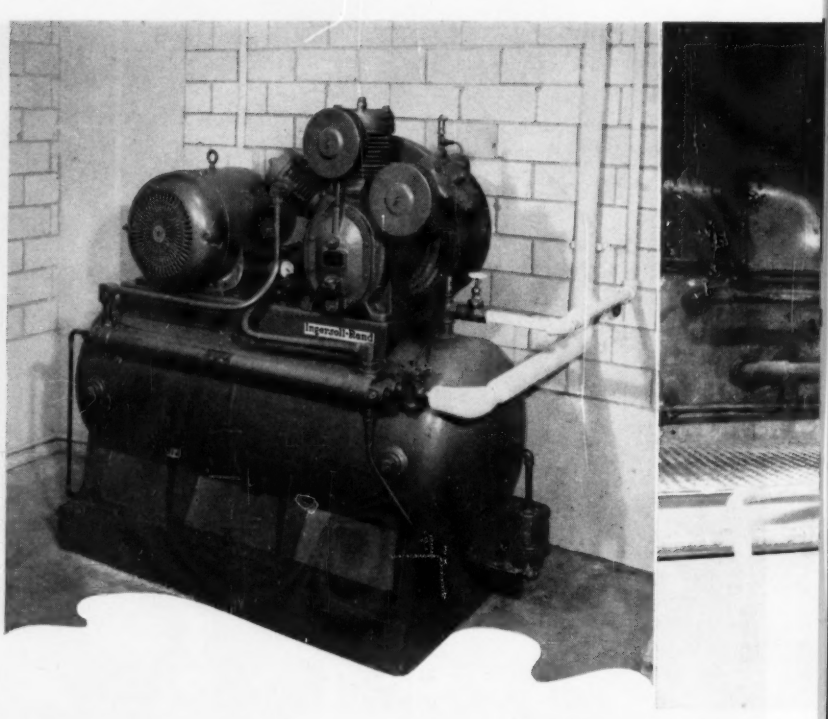
M.B. Ward, considered by many to be the founder of the modern American baking industry, set up shop in New York City about the time the steam oven made its appearance. By 1912 the Ward family controlled a $30-million baking empire. Ward's principal contribution to the industry was large-scale operation, and this idea did for baking what Henry Ford's assembly line did for the automotive industry. Although Ward was later accused of trying to establish a monopoly, many of the great advances could not have been made without the huge capital backing of his enterprises.

Towards the end of the nineteenth century another bottleneck in production was eliminated when a dough divider and a loaf molder were developed. The former takes the dough as it comes from the mixer and divides it into pieces of equal size and weight while the latter shapes the pieces into loaves, thus preventing under- and overweight. This is important because both may cost the baker money in the long run: he may lose customers and eventually come under scrutiny of the law on the one hand and, on the other, his charge is based on a loaf of given weight—he is not paid for any overage. Quality considerations also are involved, for an underweight loaf will be overbaked and an overweight loaf slightly underdone.

Since the turn of the century innovations and new equipment have been introduced into the industry at a fast rate. Hardly a year has passed without the appearance of at least one machine capable of speeding production and/or cutting cost. Rather than deal with each, in turn, which would require too much space and prove tiresome, let us take a trip through several modern bakeries and examine some of the facil-

**IN A TEXAS BAKERY**

Mrs. Baird's bread plant, in Dallas, Tex., is one of the nation's most modern establishments of its kind. Compressed air for general process purposes is supplied by an Ingersoll-Rand compressor (right), and there is a similar unit in an adjoining garage where the delivery trucks are serviced and repaired. The tropical climate—warm and humid—that is required for raising or proofing bread is maintained in the proof box of which a glimpse is seen at the bottom of the picture in the center. The I-R Motorpump on top of the box sprays water into a chamber where it saturates warm air blown in through the duct at the right. Cold water circulated through jackets surrounding dough mixers to remove the heat of friction is furnished by the three Motorpumps shown at the far right. Their flow is controlled automatically by air-operated valves.




ities that have put bread baking on an assembly-line basis. It is well-nigh impossible for a single establishment to have all the labor-saving devices that are now available, for even the latest one has become virtually obsolete between the time plans were finished and the plant constructed. And old equipment must first be amortized before new equipment can be installed.

Before we even get inside a bakery we may find compressed air in action. Not too many years ago all flour was delivered in sacks. Today some of it is transported in bulk in sanitary stainless rail cars and truck trailers. Transfer from mill to carrier and from carrier to plant is effected either by a suction or blowing system. Once inside, the flour and other dry ingredients are similarly delivered to automatic weighers, or they may be handled by a screw conveyor, an older and less efficient but nonetheless widely used device that saves much time and labor as compared with former manual methods. Automatic weighing and batching units are frequently equipped with compressed-air controls, which were recently described in this magazine.

From the standpoint of volume production, bread baked in a pan or tin probably comes first in every bakery except in those few that specialize in the Vienna or hearth type. As by far the greatest percentage of pan bread is the white variety we will follow its progress from start to finish and then point out in what way the process differs from those used in making other kinds of bread and products.

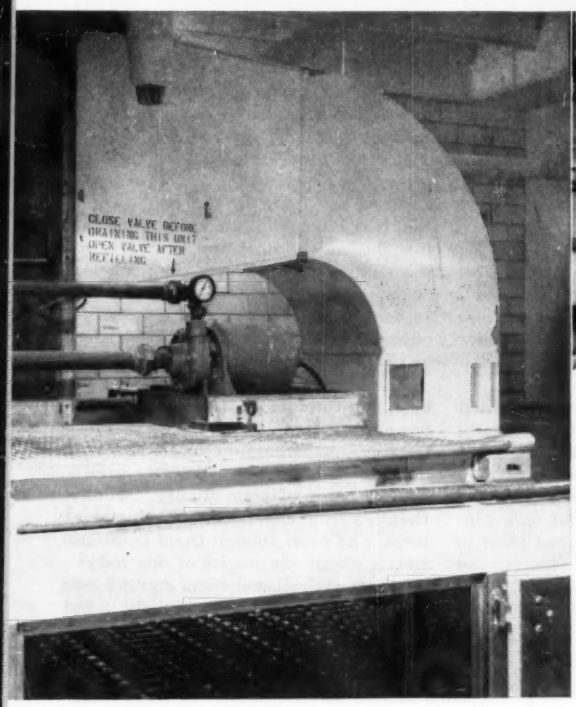
When grandmother baked a week's supply of bread she may have measured out from 7 to 14 pounds of ingredients; today bakers prepare dough in approximately 1000-pound batches. A typical bread recipe in a modern plant calls for about 350 pounds of flour, 200 pounds of water, 11 pounds of yeast, 3 pounds of yeast food and 2 pounds of malt, carefully weighed into a mixer that stirs them thoroughly. It should be remembered, however, that formulas vary from one bakery to another because of slightly different practices, regional tastes and climatic conditions.

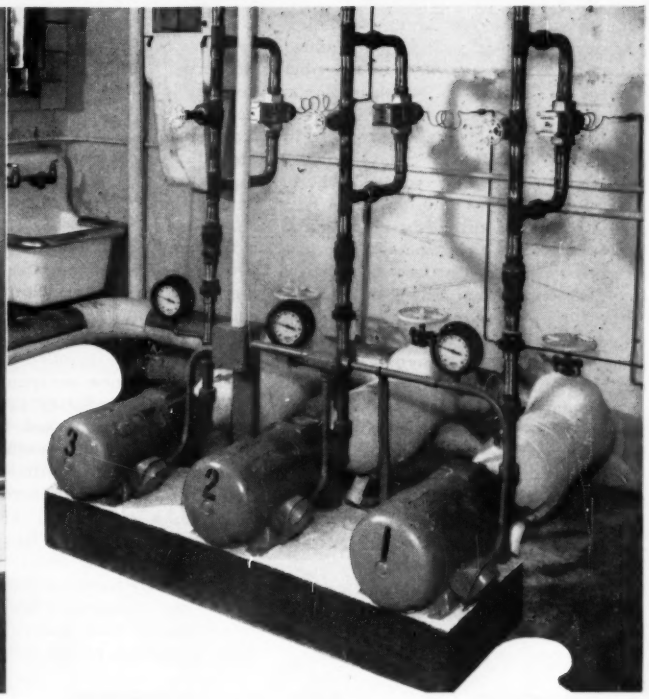
Mixing generates considerable heat, so cooling water is circulated through jackets surrounding the machine. The mass discharged from it at the end of the cycle is known as sponge and is far from being bread dough. It is set aside in troughs in a proof room where it undergoes what is roughly akin to raising dough overnight as in our grandmothers' day. The troughs must be greased before the sponge is placed in them so that the mixture will not stick to the sides. This was formerly done with a long-handled moplike brush, but now an air-operated sprayer, similar to a paint-spray gun, does the job.

After a 4- to 6-hour period in the proof room the sponge is returned to the mixer and additional ingredients are put in. If the baker is using the recipe we have given, he might add 200 pounds of flour and 160 pounds of water, plus 30 pounds of sugar, 11 pounds of salt, 22 pounds of shortening and 33 pounds of nonfat milk solids. Thorough kneading, again in a water-cooled mixer, results in bread dough, which goes once more into a trough where it is allowed to set from twenty minutes to an hour before being transferred to the make-up or dividing machine which, as has already been mentioned, separates it into uniform portions, the division being effected volumetrically by pressing it through cylinders.

Next the pieces are fed to the rounder-up which forms them into balls or rolls. These are delivered to a proofing conveyor in which the dough expands further for a short period under the influence of the growing yeast. After that it goes to the molders where each portion is shaped and dropped into a tin. The loaded pans, customarily made up into "straps" of three, four or, perhaps, five joined together to facilitate handling, are then carried, usually by conveyor belt, to another proof "box" where the temperature and humidity are closely controlled and where the dough is permitted to raise to final size before baking. In some bakeries this is effected in a large chamber through which the loaves pass continually. Often it is a part of the oven, and the pans travel to the baking section with no further attention. Pneumatic controls are used extensively to regulate the temperature and humidity in both proof boxes and ovens and play a vital role in the production of quality goods.

According to bakers, the importance of temperature control cannot be overstressed. If proofing temperatures are too high the yeast may grow too fast and produce a loaf of uneven texture, with large holes. If the oven is too cool, the bread may be pale and dry; if too hot, the crust may be thick and dark and the inside of the loaf extra heavy. Or, if bread after baking is allowed to cool under wrong conditions it may turn out to be sodden. Humidity is equally vital. If proper moisture conditions are not maintained the dough may not raise as it should and the finished product will be too dry.






After baking, the bread is transferred to a cooling chamber in which, as has been indicated, both temperature and humidity are closely controlled (it takes about 1½ hours for 1-pound loaves to travel through the final proofer and the oven). After that, it is sent to the slicer and wrapper, the two machines generally being combined. On some of these units compressed gas serves as a refrigerant. Most bread in the United States comes in wax-coated paper which is sealed after folding the ends by melting the wax and letting it harden. As an airtight closure is not always assured when the wax is allowed to cool at room temperature, some bakers "freeze" it as soon as a loaf leaves the wrapping machine. This is done by pressing refrigerated plates against both ends while the bottom flap passes over a similar plate.

Along our composite bread-production line we were forced to go past several important pneumatic applications because they did not immediately pertain to the matters at hand. One big user of compressed air is the automatic pan greaser which operates much like a spray gun. It is set up in such a way that each pan, as it travels along underneath it, is quickly coated with oil or grease which makes it easy to remove the baked loaf. Though varying in type, the spray action of many of these machines is regulated by pneumatic controls.

Before the adoption of automatic devices, tins were hand coated with oil by a small brush, a method that not only consumed time and labor but did not permit uniform greasing. If too much oil was applied the flavor of the bread was adversely affected. Conversely, if not enough was used the loaves stuck to the pans causing a lot of trouble because it was necessary to "dig" them out. Within the last few years another process has been developed that may eliminate greasing. It makes use of a special silicone glazing compound that is also applied by pneumatic spray gun and of which one coat is said to suffice for an average of 200 bakings before renewal is required. Besides all that it does away with greasy floors and uniforms as well as smoke from burning grease.

Another pneumatic device enables bakers to put an end to certain unsanitary conditions that have long plagued them in make-up rooms. It is customary to dust dough with flour to prevent it from sticking. Usually, the job is done by mechanical means and results in spreading flour all over the bakery. But with the newer system a pneumatic "puffer," covered partly by a hood, does the work and applies starch dust instead of flour. Air at about 25 psi pressure serves to convey the powdery material from a hopper to the machine and is then reduced to 1-5 psi for the actual puffing, any excess starch being sucked into a dust collector by an exhaust fan. Not only does the hood confine the dust but it also makes it possible to reclaim a large amount for reuse. Bakers who have installed the equipment are enthusiastic about it because of its many advantages. Only 80 pounds of starch is needed for a job that formerly called for 360 pounds of flour, for example. Besides there is less waste and less to clean up, which all adds up to a considerable reduction in operating costs.

Buns and rolls are often baked from the basic dough that is prepared for white pan bread. However, a baker controls the proofing time so as to make either a light or a heavier product, depending upon its use and local tastes. For instance, the popular cloverleaf rolls are considered best when very light. On the other hand, wiener and hamburger rolls are usually a little heavier so that when hot meat is placed in them they won't become soggy. Vienna, garlic and French breads contain a variety of extra flavorings and are ordinarily hearth baked; that is, baked on a flat surface without retaining sides to make them crusty and to give the loaves their familiar shape. The method of producing brown or cracked-wheat bread varies little from that of baking the white variety except, of course, for the ingredients, a coarser unbleached flour being used.

Although it would seem to be more efficient to utilize the same equipment for the various kinds of bread, most bakeries have separate make-up machines and ovens for different products and some even go so far as to provide individual dough-mixing and proofing facilities. The decision to integrate or segregate is based largely on the volume of business, the general idea being to keep all equipment in operation as much of the time as possible.

Another air application which shows promise in the industry is that of

atomizing and forcing liquid shortening into dry mixtures. It is said to reduce the amount of fat as well as the time needed for adequate "creaming," the reason being that the shortening is broken up into tiny globules which, in the aggregate, have a far greater surface area than a similar quantity in bulk. Also, penetration is more uniform. This operation enters primarily into making cakes and similar products. For this purpose most bakeries have a separate line with fewer labor-saving devices because of the lower volume of production. In addition, because most cake batter is unleavened it does not have to be kneaded, thus eliminating proofing rooms.

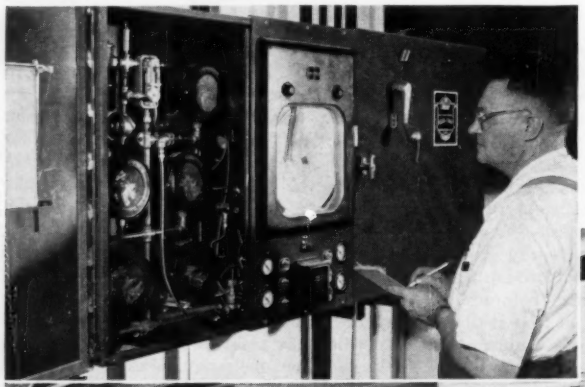
Automatic pan greasers as well as several other pneumatic machines are in wide use on cake-baking lines. In preparing certain mixes, for example, air is forced into the bottom of the bowl to make the batter lighter. Clean, dry air is, of course, necessary for this purpose and that is why some bakeries have installed nonlubricated compressors of the graphite-ring type. Others have more or less elaborate filters to clean the air supplied by regular plant compressors.

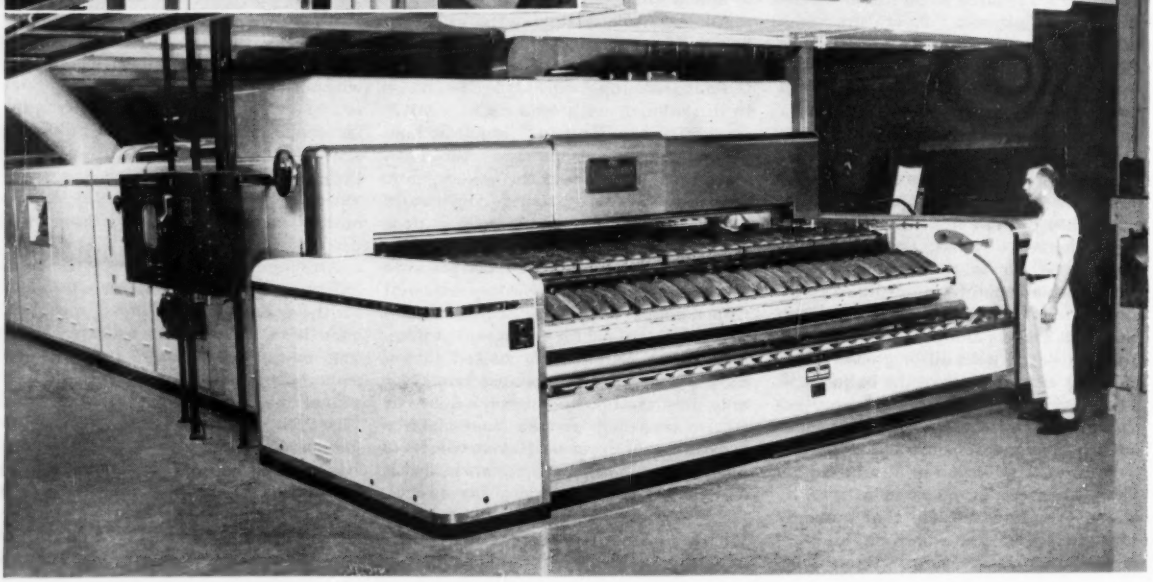
Besides the air applications mentioned there are others which are typical of all industries. Blowguns perform varied cleaning jobs and other services such as clearing away paper trimmings on wrapping machines. Pneumatic tools are needed particularly in large bakeries that own and operate large fleets of trucks. Even if they themselves do not do the maintenance work, a compressor is frequently available for servicing the vehicles—for inflating tires and powering grease guns. One plant even has a small Ingersoll-Rand Jackhamer so holes can be drilled in concrete walls when new piping has to be installed or foundation work done for new equipment.

The baking industry in the United States has been marked by a steady rather than a quick growth. Like most food industries, its continued expansion depends more upon an increase in population than in demand. But as an investment proposition it has one thing in its favor—it is as nearly "depression proof" as any business can be. Indeed, during hard times more bread is generally consumed than during good times. That is because people fall back on the staples during a money shortage and tend to buy more expensive foods when it is plentiful.

Future expansion will in all likelihood be confined to bakeries already in existence and will be characterized by the enlargement or rebuilding of facilities rather than the construction of new ones. Trained observers in the field believe that this will be the case for two reasons: first, because competition is already intense and, second, because a great deal of capital is needed to put a bakery on its feet. Then, too, the merchandising of a new brand in an already well-sold territory is a tough proposition.

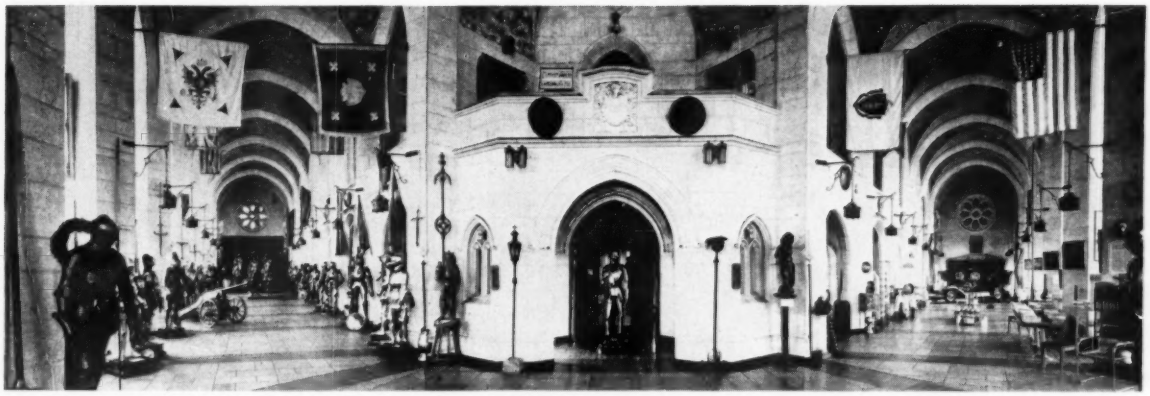
Baking has developed into big business, and throughout its years of growth has encountered and solved many problems. The paramount one was living down store-bought bread's early reputation of being of poor quality. Today, thanks to the efforts of the industry at large, and even though there is intense feeling about the merits of one baker's products as against those of another, few consumers say that commercially baked bread is less tasty than grandmother's and fewer still that it is less nutritious.





**EMERGING FROM OVEN**

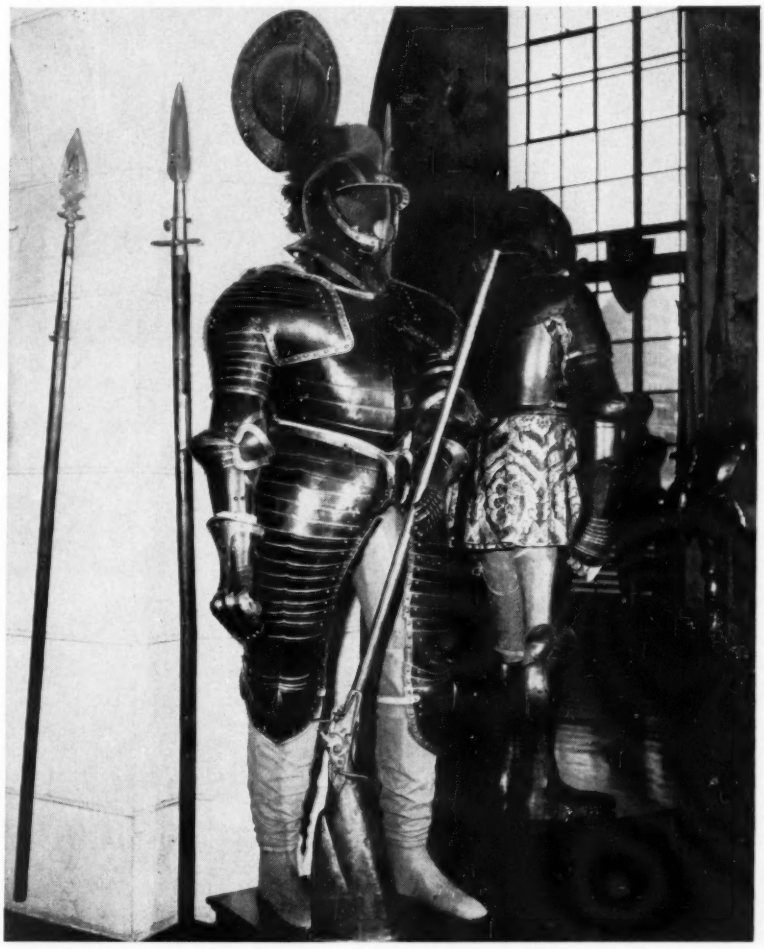
The discharge end of a bread oven at Maier's Bakery is shown at the bottom. As the moving bed reaches this point, the bread is automatically removed from the pans, which are sent back to be reloaded while the bread passes to an overhead cooler. On the left side is a box containing pneumatic controls which automatically regulate the temperature and humidity inside the oven. The other picture is a close-up of a similar control box with the cover removed to reveal the individual instruments. It is mounted on a proof box.



**IN THE HIGGINS ARMORY**

A section of the extensive museum of steel applications which includes 147 suits of armor. Two of the latter are shown below at close range. The one on the left, called a three-quarter suit, is holding an air gun that was used by Austrian soldiers in the 18th Century. In its enlarged stock is an air reservoir that was charged with a hand pump.

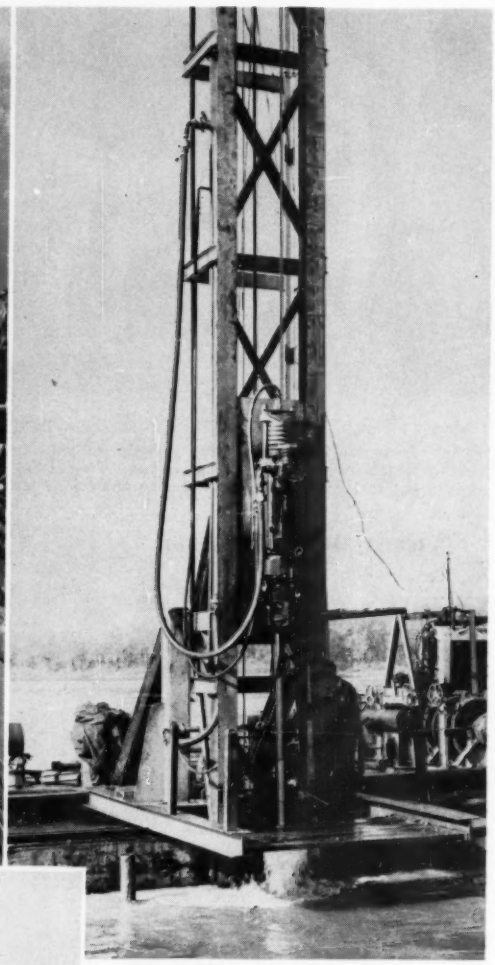
## Ancient Air Gun

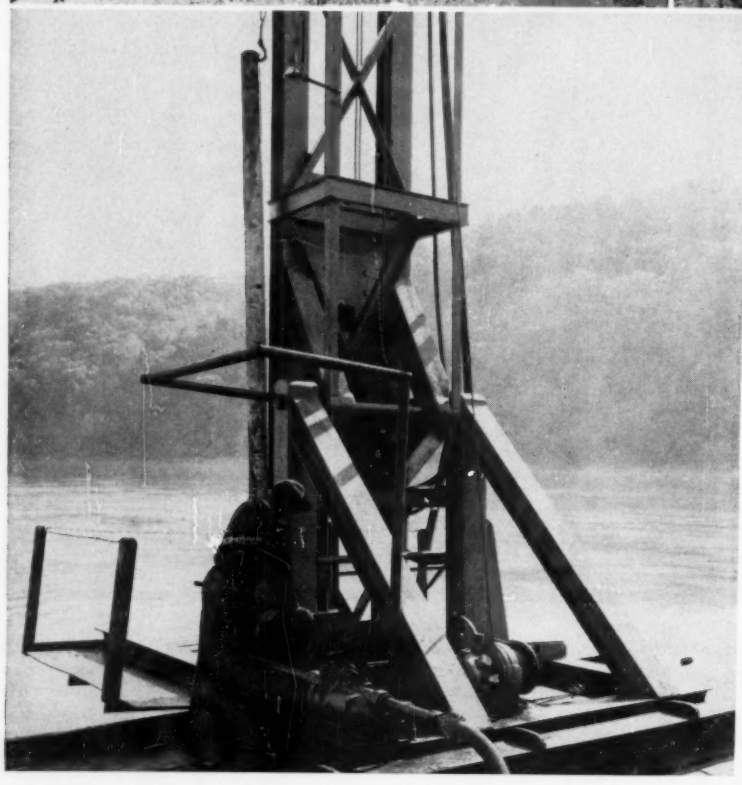


WHILE in Worcester, Mass., gathering material for the article on the Hi-Pac Division of the Worcester Pressed Steel Company, which appeared in our November issue, we ran across a compressed-air application that is about 300 years old. In a private museum owned by the firm stands a seventeenth-century suit of armor firmly clasping in its steel hand a contemporary gun which uses air as the propelling medium. The museum was founded by John W. Higgins, the company's president, to show steelworking through the ages.

The entire third floor of the office building is given over to what is known as the Higgins Armory, which is what might be termed the static part of the museum. It has two wings, one of which houses a collection of 147 complete suits of armor with appurtenant weapons and selected pieces of steel and the other later examples of steelwork including an automobile and an airplane. Above the main floor are galleries displaying man's progress from the stone to the steel age. They also contain a fine collection of works of art from leaded windows to paintings and tapestries. This is the active section which, together with the armory and the manufacturing plant, is open during working hours. Guests may come and go as they please, and there isn't a "Do Not Touch" sign anywhere. Yellow lines guide visitors through the factory, and a full-time curator is on hand in the museum to answer questions. Thousands of school children as well as adults tour the plant each year, bringing away a better understanding of the world of steel of today and ages gone.

But to return to the gun. To quote from the tag which identifies it: "Such guns, utilizing compressed air, were outlawed in France in the 17th Century because they were used by bandits who were able to kill their victims without attracting attention with a powder explosion. The hollow butt of this weapon carries a charge of air, compressed by a hand pump. The fake flintlock was added to disguise the unlawful gun. The trigger which releases the hammer also opens a valve for the compressed air to project the bullet without noise. Air guns like this one were used as a secret weapon in the Austrian War in the 18th Century."





**VIEWS ON NO. 1 BARGE**

Pictured at the top-left is the 8-foot-gauge track for the drill tower. The left rail at the edge of the barge is of the conventional railroad type. The right rail consists of two channels—one visible on the bottom flange of an I-beam and the other one welded to the lower face of the upper flange. This arrangement prevents the tower from tipping forward because of the weight of the drill and slabback it carries. On top of the I-beam are stops to mark the successive drilling stations. In the center of the runway are two cables that move the tower. They are powered by a winch behind the cameraman. Supt. Al Sumrall is standing on the right.

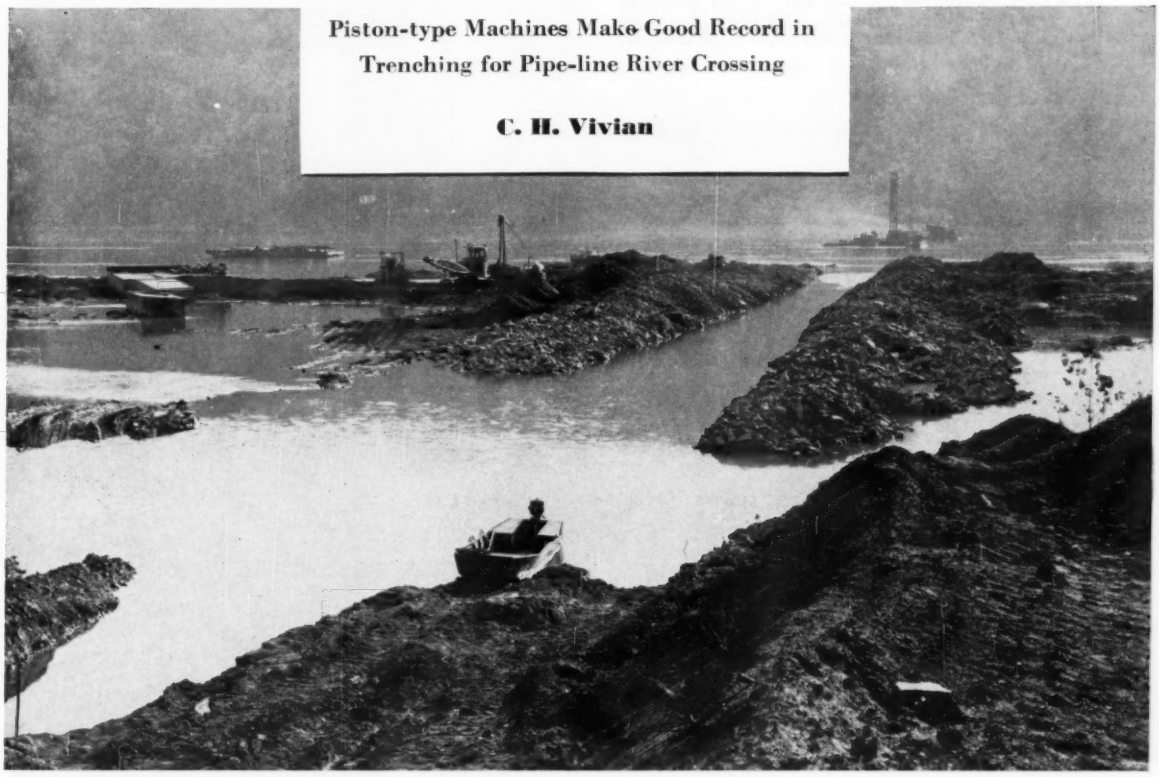
The drill is shown in operation above. Water is issuing from the casing on the downstroke. A piece of casing extending above the water's surface left of the tower base marks the location of the previous hole drilled.

At the left is a close-up of the back of the tower base with its two air hoists that serve to elevate the drill and handle casing. There is a lubricator in the air line running to the hoist at the left. A piece of casing is hanging from a hook on the left side of the tower.

# NEW TRICKS FOR SUBMARINE DRILLS

## Piston-type Machines Make Good Record in Trenching for Pipe-line River Crossing

**C. H. Vivian**



**VIEW FROM EAST BANK**

The trench in the foreground resulted from the shooting of 188 holes that were put in with twin drills hung from the side boom of a tractor. This picture and the one on the cover were taken from opposite sides of the stream.

FOR the second time within a few months the air-operated piston drill has proved its worth in trenching a rocky river bottom for a pipe-line crossing. An article in our October, 1954, issue told of the good results obtained with this type of drill by Pentzien, Inc., while laying a dual gas line across the Susquehanna River upstream from Harrisburg, Pa. Largely as a result of that experience, Missouri Valley Dredging Company adopted similar equipment for stringing a single pipe across the same stream at a different location. The drilling phase of the operation took less than three weeks and was completed on November 11.

The line will carry natural gas and is being built for the Manufacturers Light & Heat Company, of Pittsburgh, Pa., a subsidiary of Columbia Gas System, Inc. Of 12-inch-diameter welded steel pipe with 3/8-inch walls, it crosses the Susquehanna about 2 miles north of Marietta, Pa., and from a connection with Metering Station 24A of Texas Eastern Transmission Corporation on the east bank of the river will transport gas a few miles westward for distribution in the Lancaster-York area of Pennsylvania. The Texas Eastern system that brings the gas from Texas is the much-publicized "Big-Inch" which was constructed by the Government to carry crude oil during World War II and later converted to gas service. It crosses the Susquehanna a few hundred yards upstream from the Manufacturers' line.

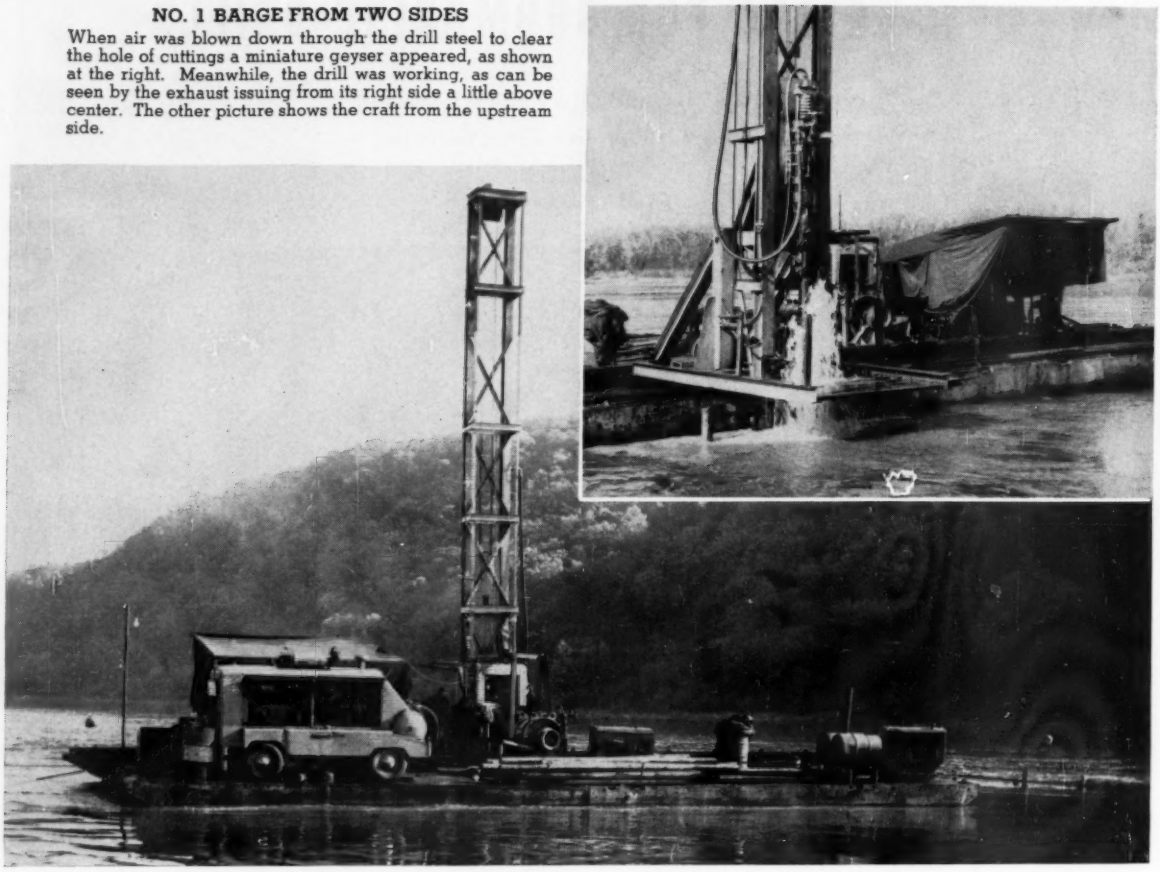
Missouri Valley Dredging Company and Britton Engineering & Construction Company, of Forth Worth, Tex., jointly contracted to build the section of the line extending from the metering station to and across the river and thence 7 miles westward. Then they divided the work, Missouri Valley taking over the crossing job and the land link from the stream to the metering station. The river section is 2100 feet long, 1200 feet of which required underwater excavating.

The specifications called for burying the pipe under at least 3 feet of cover, and to make certain that this would be accomplished the contractor decided to drill the river bed to an average depth of 12 feet. The holes were arranged in two parallel rows about 5 feet apart and extending from bank to bank. The holes in each line were spaced at 6-foot intervals and staggered in relation to those in the opposite row. The lines on the east side of the stream, where the bank slopes gradually, were extended shoreward, and there drilling was done with conventional drifter-type hammer drills hung from the side boom of a tractor. Floating equipment was called for, however, from water's edge to water's edge, and offered a choice of several types of drilling rigs.

Having observed the satisfactory results obtained by Pentzien, Inc., with an Ingersoll-Rand SD-65 piston-type submarine drill mounted on a tower erected on a barge, Missouri Valley decided to use such a drill but a somewhat different barge arrangement. The original plan, which wasn't carried out completely, was to set up two movable towers on a runway on one side of a barge so that several holes could be drilled in a line before moving the barge. This, essentially, is the arrangement, on a smaller scale, universally followed on larger drill boats for general subaqueous excavation, as described elsewhere in this article. Actually, for reasons that will

**NO. 1 BARGE FROM TWO SIDES**

When air was blown down through the drill steel to clear the hole of cuttings a miniature geyser appeared, as shown at the right. Meanwhile, the drill was working, as can be seen by the exhaust issuing from its right side a little above center. The other picture shows the craft from the upstream side.



be given, only one mobile tower was put in service.

A barge 28 feet wide and 53 feet long was made by assembling eight 7x26½-foot rectangular steel pontoons, four abreast and two lengthwise. The tower, fabricated from steel, was 45 feet high and approximately 8 feet square at the base, with a vertical front and a tapering back. Under each corner of the base was an 8-inch wheel. The two in front were flanged to run on an ordinary railroad rail that was laid along one side and close to the edge of the barge deck. The two rear wheels were flat-faced and traveled in channels that housed them both top and bottom to prevent the tower from tipping forward in case of a strong pull on it. As an accompanying picture makes clear, the 2x2-inch channels were welded to the top and bottom flanges of an I-beam that was, in turn, welded to the deck. The tower was moved to new hole locations by a cable handled by an American single-drum, electric-driven winch. The line passed around pulleys at each end of the 8-foot-wide runway.

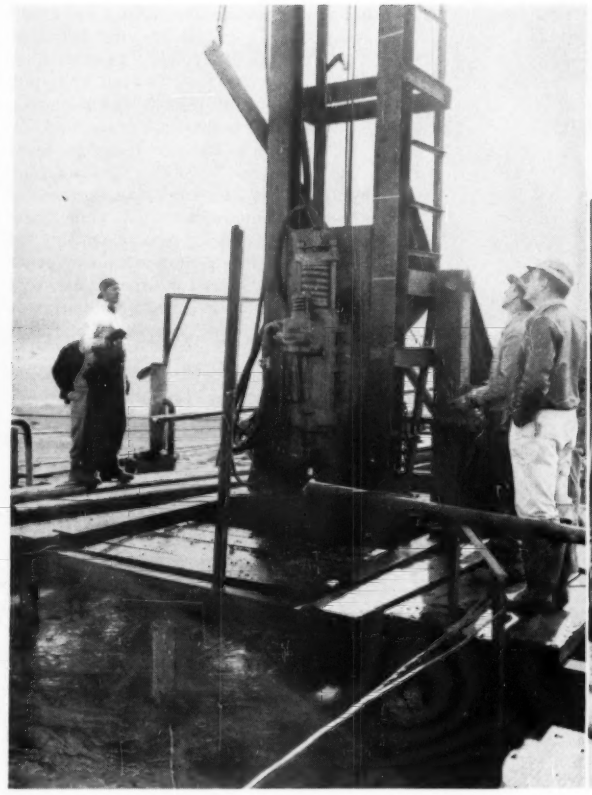
The 2500-pound drill was mounted on a 5700-pound slabback that ran in guides on the front of the tower. A single 25-foot length of alloy-steel drill bar having an outside diameter of 3¾ inches and a central 2½-inch hole for the passage of air with which to blow out cuttings was used to put down the entire hole. The rod was just long enough to reach the prescribed level in the rock when working in water of maximum depth. Two Ingersoll-Rand air hoists were in-

## EVOLUTION OF THE DRILL BOAT

BEFORE dynamite came into use, a long bar of iron with a pointed lower end was bounced up and down on submerged rock that was to be cleared away. This simple implement gouged out or broke off pieces of varying size, the volume of work done depending upon the character of the formation and on how much trouble was experienced with the crude equipment. In an effort to improve their effectiveness in hard rock, the bars were gradually increased in weight to 4 or 5 tons. From this early rig came the huge Lobnitz breaker, with a 19-ton bar, which was utilized in digging the Suez Canal opened in 1869.

A "chisel boat" that operated on the same principle was designed by Army Engineers in 1872 to remove obstructing rock from the Mississippi River at Rock Island Rapids. It remained in service until 1889. The shattered rock was cleared away by a dipper dredge. There was no spare chisel, and when that member became dull it was shipped to Chicago for resharpening, the boat being idle until it came back.

Meanwhile dynamite, which had been invented in 1867, and piston-type rock drills, which had reached the commercial stage in the early 1870's, were gradually being put to use excavating rock on land. It was only natural that efforts should be made to employ them in underwater work, and that was apparently first done in 1881 by W. L. Saunders, founder of this magazine. For the removal of Black Tom Reef in New York Harbor, he designed a raft or platform that was lifted clear of the water on four anchor spuds or posts. He also originated the idea of drilling inside a piece of tubing, called a mud pipe or sand pipe, to keep earth and gravel out of the hole. The drills worked through openings in the deck and were



**DRILL ON NO. 2 BARGE**

Details of the tower with the drill mounted on a slabback running in guides between the two forward vertical members are seen at the left. Projecting above the water in the foreground are two pieces of casing in drilled holes. The other picture shows the drill bit being lowered to push a piece of casing down into a hole. The casing is inside a sand pipe, which was pulled after the casing was seated.

stalled at the base of the tower and lines from their drums passed over sheaves at the tower top. One hoist raised and lowered the drill and slabback and the other one handled sand pipe, casing, etc. Compressed air was supplied at 100 psi by an Ingersoll-Rand Gyro-Flo 600-cfm portable compressor. With this pressure the SD-65 drills most types of rock satisfactorily, although it performs best with air at 125 psi.

The barge was not equipped with spuds to hold it steady but, instead, was moored by means of wire ropes extending, one from each corner of the craft, to four 10-ton concrete deadmen sunk in the river—two upstream and two downstream. The cables were manipulated by a 4-drum winch that was designed for use on a fishing vessel and driven by a Ford industrial-type gasoline engine.

In traveling from one end of the boat to the other, the drill tower could put down eight or nine holes in line from each barge location. Those in the downstream row were put in first; after that the barge was moved upstream 5 feet and the second line of holes drilled. The craft was then maneuvered laterally a distance equal to its own length and the cycle repeated.

Missouri Valley Dredging Company did not start assembling its equipment until September, and with thoughts of possible floods or freezing weather in mind the operations were pushed to beat the coming of winter. The barge, with one tower in commission, went into service on October 24, and the plan was to add the second tower as soon as it could be put together. However, this would have made it necessary to stop drilling and to move the boat to shore.

Rather than do that, the contractor adopted the time-saving measure of assembling another and smaller craft and mounting the second drill tower on it as a stationary unit. This boat consisted of two tandem groups of three pontoons abreast with the central forward unit cut off to provide a block-U-shaped open-

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mounted on tripods carried on frames so they could be moved to new drilling locations.

The evolution of the modern drill boat began on the Great Lakes, where there was need for equipment that could remove rock to create ship channels. Improvements followed rapidly, and in 1893 Army Engineers put in service a craft patterned after the Great Lakes design. Its piston drills were mounted on wooden towers that ran on rails along one side of the vessel. Later boats had towers of steel and up to five drills. Except for refinements, today's drill boats are of this type. Hammer drills have been used to some extent, but those of the piston type have predominated. This is largely because experience has proved that the action of the piston drill is better adapted for "fighting" tight or stuck steel in broken ground and for the muddy conditions encountered in submarine operations.

Although such boats have long been virtually standard equipment in excavating ship channels and doing other extensive rock work in rivers and harbors, pipe-line contractors have understandably developed their own lighter and less costly craft for handling the numerous comparatively small river-crossing jobs that have arisen in recent years. A vessel for that purpose is commonly built so that it can be easily dismantled and shipped to new sites, and the drilling tool has usually been of the churn type. This may be explained by the fact that these contractors are generally familiar with the somewhat similar cable-type drill that once put down all our oil wells and is still in considerable use for shallow holes.

In turning to the piston drill, then, contractors are merely reverting to a tool and a principle that proved their merits for underwater work more than half a century ago.

**BITS AFTER SERVICE**

Here are four of the seven Carset bits as they looked three days before the job was completed. They drilled 379 holes and obviously had much more service left in them. The bit at the right end and the second one from the left show inward curves on top. This tendency to wear the gauge "barrel-shaped" was noticed when bits were working in the quartzite formation that was found in some areas.

ing. The tower was installed at the base of this recess and was identical with the first one except that the wheels were left off. By adding these later the tower can be made mobile to join the other one on future river-crossing jobs that may be handled by the company. With this in mind, the barges, as is the general practice in the case of all pipe-laying equipment, were built so that they can be readily dismantled and the sections transported by truck.

Like its companion, Barge No. 2 had no spuds and was maneuvered by means of wire ropes attached to deadmen, the only difference being that the lines were manipulated by two small winches instead of one large one. As the tower was stationary, the boat had to be moved laterally to each succeeding drilling position, and in doing that the holes in the downstream and upstream rows were put down in alternate order. This barge also carried an Ingersoll-Rand Gyro-Flo 600-cfm portable compressor to supply air power for its drill and hoists.

Like most rivers, the Susquehanna varies throughout its course and from season to season, and conditions at the site of this job differed considerably from those prevailing during the summer at the Pentzien undertaking upstream. Instead of a maximum depth of 5 feet of water spread across a width of more than 5000 feet, the Missouri Valley forces had to work through faster-flowing water up to 15 feet deep and confined within the much narrower width of 1200 feet. At the Marietta crossing the bottom consists of rock, bare in some places, but usually covered with from a few inches to several feet of gravel, silt or fine coal. The rock is predominantly limestone, with some quartzite near the center of the stream and a short stretch of shale near the west bank. The quartzite is, of course, the most resistant of the materials, and drilling progress in that formation was slowest.

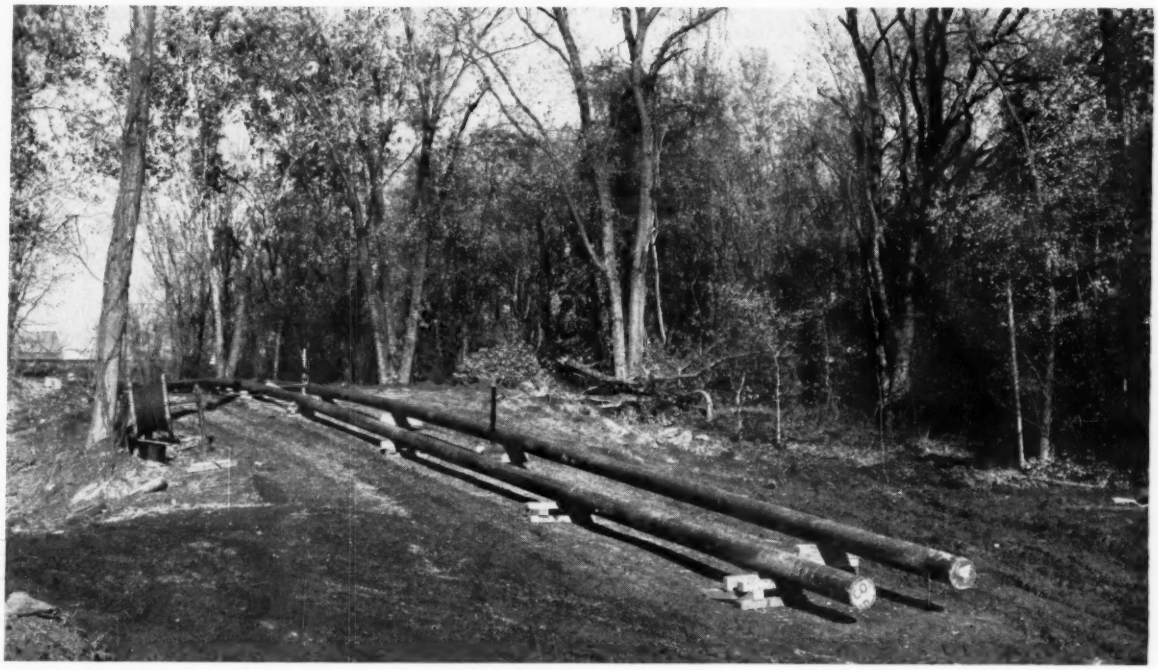
To make every minute count, an available barge-mounted rotary drill was put in operation while Barge No. 1 was being equipped. It drilled 78 holes before it was taken out of service. The remaining 379 holes in the river stretch were put down with the two piston-type machines. Of these, 321 holes were accounted for by Barge No. 1. It was in operation from October 24 to November 11 and normally worked 24 hours a day, seven days a week. Deducting time lost while blasting, moving, making repairs, waiting for casing and through miscellaneous other causes, the contractor figured the total drilling time at 290 hours, which gives an average of 54 minutes per hole. Barge No. 2, which was in service only four days, November 7-10, completed 58 holes in 80 hours, or an average of 83 minutes per hole. The longer time was attributable to the fact that the boat had to be moved after each hole was drilled.

Combined, the two barges averaged a hole every 58 minutes. The best single-day performance was 31 holes (aggregating approximately 372 feet) by Barge No. 1 on November 8. Barge No. 2 put down 19 holes the same day, making a total of 50 holes (600 feet) for the pair. Barge No. 1 drilled 27 holes on two different days and completed more than 20 holes on seven of the eighteen days it was in operation.

All this drilling was done with seven Carset (tungsten-carbide insert) bits, four of 6-inch and three of 5½-inch gauge. Taking the average figure of 12 feet per hole, they collectively put down 4548 feet of hole, or an average of 650 feet each. No bit was broken and none

**AIR COMPRESSOR**

Each barge carried one of these Ingersoll-Rand 600-cfm Gyro-Flo portable compressors to power the drill and hoists. Although the SD-65 piston drill was designed to operate at 125 psi pressure and does its best work in that range, satisfactory results were obtained on this job with 100 psi air.



**READY FOR A DUNKING**

The pipe for the river crossing is shown here running back through the woods on the east bank. It was later floated into position, welded into a continuous section and sunk into the trench in the riverbed.

was worn out. Nor was there any drill-steel breakage.

To exclude gravel and other loose material from the holes, drilling was done through a sand pipe that rested on top of the rock. After a hole was bottomed, a piece of 5½-inch-diameter casing, long enough to reach above the water surface, was inserted and pushed to the bottom by the piston drill. This preserved the opening and marked its location until it was loaded and shot. Charges consisted of 60 or 75 percent dynamite in cartridges weighing 16⅔ pounds each. Usually two but sometimes three were placed in each hole.

The 645 holes within the confines of the Susquehanna were shot in four groups with Primacord fired electrically. The first one, made up of 167 holes in the east bank and 161 in the adjacent river section, was detonated on November 2. On the following day 132 holes in the stream near the west shore were fired. The third blast, touched off on November 12, consisted of 164 holes in the central part of the river. The final 21 land holes on the east bank were detonated on November 15. Approximately 17,000 pounds of explosive was used in the river holes, or an average of 37 pounds per hole.

Broken material was removed from the trench with draglines and backhoes working from barges and piled alongside the excavation for use as backfill. Preparatory to laying the pipe in the trench it was assembled in three welded sections on the east bank to be floated into position, welded together and sunk into place. Semicircular concrete weights, flanged for bolting together in pairs to encircle the pipe, were used to give the line the necessary negative buoyancy to keep it down. Each concrete "bracelet" weighs 1400 pounds in air and 789 pounds in water. At the time of writing (December 6), the contractor expected to finish the river crossing by Christmas.

Al Sumrall served as superintendent for Missouri Valley Dredging Company and Lewis Byerly as resident engineer. Joseph G. McMaken, president, and Virgil M. Bull, vice-president of the company, also spent considerable time on the job. The firm's home office is at 222 William Street, Omaha, Neb.

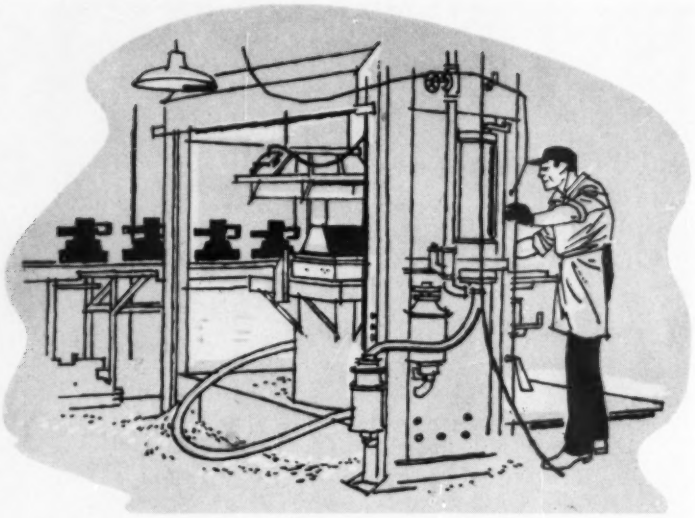
**BOSS ON A BARGE**

Supt. Al Sumrall (sitting) and one of his men aboard a supply barge on a crisp but sunny day in November.

*88 Years of Foundry Experience*

# The Dayton Malleable Iron Company

Allen S. Park

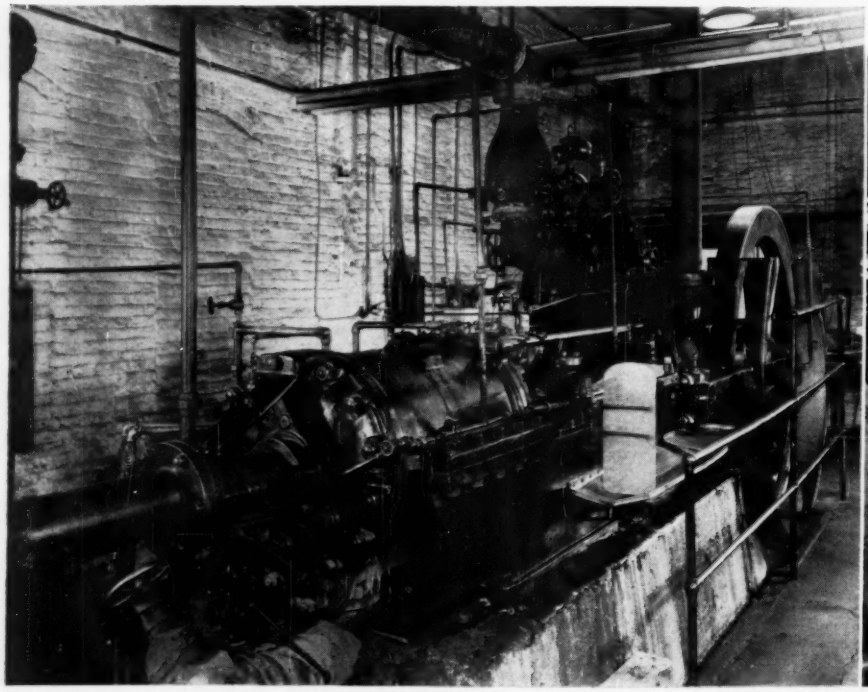


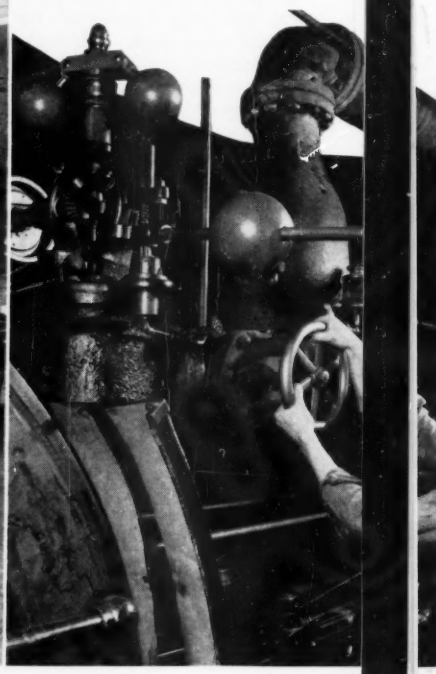
THE Dayton Malleable Iron Company, currently operating four foundries, has tallied 88 years of experience in its field and weathered numerous depressions and industrial transitions. And today, despite the growth of welding of metal plates and the rise of plastics, the concern still believes that old-line cast and forged materials have a good future.

In its report on 1953 operations, the management ventured the opinion that "the foundry industry . . . presents greater opportunities at this time than ever before in its history. In the last few years, a number of new foundry products and some completely new processes have been developed which will have great importance for the future of the industry. In addition . . . there have been many important developments in foundry equipment. Only those companies which are willing to make substantial investments in equipment can take full advantage of these new developments . . . . In view of these considerations, we expect to spend substantial sums of money in the course of the next two years on our plants and we also believe that it is necessary to allocate more funds to research." Thus does a long established firm adjust itself to inevitable change and prepare to maintain its position in the industry just as it has done for more than seven-eighths of a century.

Dayton Malleable began as a partnership in 1866 and was incorporated in 1869. Its headquarters have always been in Dayton, Ohio, but its operations have spread to other parts of the country and its products are used throughout the United States. Originally it made castings of malleable iron for carriage and saddlery hardware. Since then it has diversified its lines until they include a great variety of malleable-iron, gray-iron, steel and aluminum castings and steel forgings that enter into a long list of manufactured products for use in transportation, industry in general, on farms and in homes.

Four plants, all strategically located to serve the highly industrialized Mid-





west, are run as separate divisions of the parent concern. The Dayton Division, where the business began, has made gray-iron, malleable-iron and aluminum castings to order for various industries. This venerable establishment has, however, become a victim of circumstances beyond the control of the management, and operations that have been centered there for so long are now being moved to a new plant in Columbus, Ohio, that was acquired in 1953.

When the Dayton plant was founded, it was out in the country. As the city grew to and beyond it, streets were cut through the property, and when additional buildings were put up they were necessarily separated from the others. That was all right as work was then conducted, but it has proved to be a serious handicap during recent years. Modern streamlined foundry technique requires a plant under one roof for efficient operation, and it was impossible to convert the old place and bring about such an arrangement. In fact, with the growth of street traffic, it has proved difficult to transport materials across the busy thoroughfares from one building to another. The move to Columbus will not affect the head office, which will stay where it has always been.

In another section of Dayton, the company has a division where gray-iron castings, mainly for automobile and household-refrigeration industries, are turned out under favorable conditions lacking in the older plant. Known as the GHR Division, this establishment takes its name from the initials of its founders, Gartland-Haswell-Rentschler. The Haswell in this combination was the father of Anthony Haswell, now president of DMI.

The Ironton (Ohio) Division is a malleable-iron foundry that makes some of the largest castings of this kind for the automobile trade. The fourth plant, located in Buffalo, N. Y., is the Pratt & Letchworth Division. Its principal products are steel castings, steel forgings and steel coil springs, which are supplied mainly to railroads and manufacturers of railroad equipment.

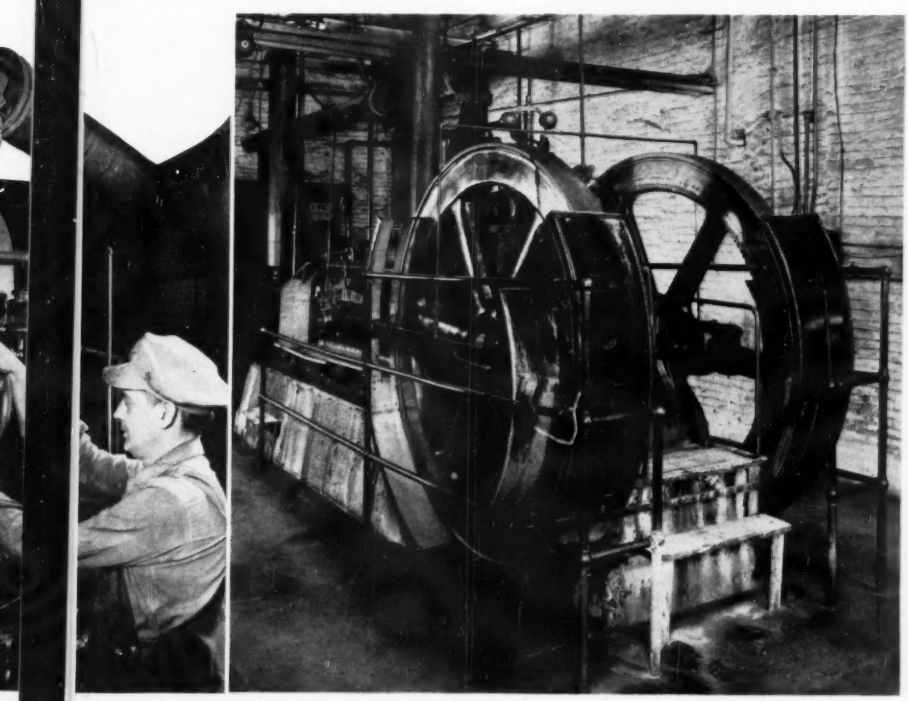
Around 60 percent of the output of all four plants goes to the automotive industry, 20 percent to railroads, and the remaining 20 percent to builders of refrigerators, agricultural and electrical equipment and miscellaneous products.

A trip through the GHR Division affords the visitor an interesting view of a highly mechanized gray-iron foundry that is geared for high production. It is essentially two foundries in one, there being two substantially identical setups that make for flexibility of operations and enable the plant to meet the varying demands for its products with facility. For example, each section has four cupolas, two of which are alternated in service from day to day, thus allowing time in-between for repairs. The division can turn out 75,000 tons of castings per year.

Incidentally, the visitor learns that the trend in this type of foundry is towards the use of more compressed air, and this one has, in fact, just installed a new 1660-cfm unit which brings the number of machines to five with a combined capacity of 4960 cfm. The plant has had enough air to supply its needs, but without provision for standby service. The new compressor will permit taking one of the older units off the line and holding it in readiness for reserve duty.

William Maier, the foundry engineer who served as guide for the tour, pointed out that, in order to meet the prevailing demand for precision castings, the sand must be compacted in the molds with greater density than ever before. This calls for the use of more air power. In each section of the foundry are 32 molding machines arranged around a loop of power conveyors and fed with sand from an overhead delivery system. Each of the big machines has a 16-inch air cylinder to pack the sand in the molding boxes or flasks by a squeezing action, and inside the larger cylinder is a 10-inch one to produce the intermittent jolting action that distributes the sand evenly throughout the flasks prior to the big squeeze. Each molder will turn out an average of 40 flasks per hour on one of the big models and 900 per day on a smaller one, so it is easy to see why so much air is needed. In addition, air performs its traditional service of operating hand-held tools, mainly grinders, in the department where castings are given their final cleaning.

Molds thus prepared receive their charge of molten iron from ladles as they move into position on the conveyor. As soon as the still hot metal has hardened, the casting is dumped out of the flask into a shake-out device where, as the name implies, it is vigorously shaken mechanically to rid it of the bulk of its envelope of sand. The casting is now carried underfloor and then elevated to en-



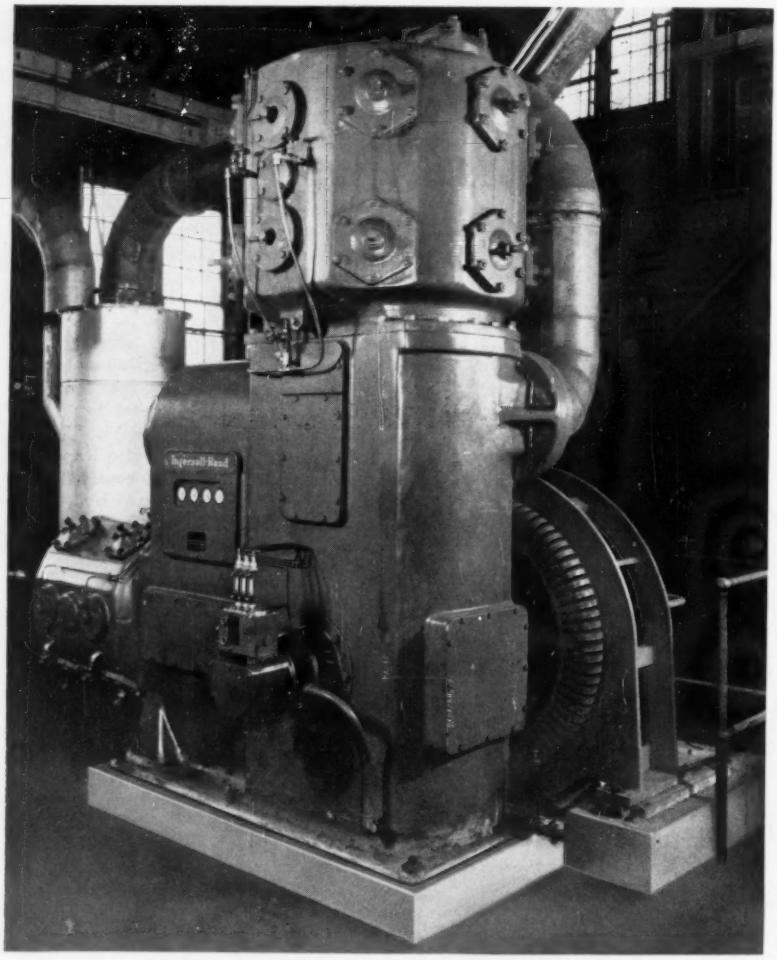
**A COMPRESSOR THAT RAN FOR 45 YEARS**

Views of the 1909 air compressor that was still in operating condition when the plant it was serving closed down last year. Built by Ingersoll-Rand Company in Phillipsburg, N.J., the 17-ton machine had one steam cylinder and one compressing cylinder, each of 24-inch bore and 30-inch stroke, arranged in line. The Class A unit, as it was called, was patented in 1889, and the name plate on this one listed twelve patents in all up to 1904. The air to be compressed was taken in through the compressing cylinder piston, and the inlet can be seen at the outer edge in the picture at the extreme left. The record shows that no replacement parts were ordered from the manufacturer until 1928. Spare parts became unobtainable later, and during the last decade the foundry made any that were needed. The only major repair evident was a weldment on the crosshead. Raymond Pierce, who had charge of the machine in its later years, is shown in the center at the control throttle. The flyball governor which regulated the unit's speed is at the upper-left. Before it was taken out of service, the compressor was offered to one of the nation's leading museums for preservation, but was not accepted.

ter a long cooling tube. The empty flask and sand go their separate but well controlled ways. This sand, together with the final quota that is yet to come off the casting, is fed to a reconditioning system and eventually back into more flasks. It is cleaned, properly moistened and recycled entirely automatically under the control of an electrical panel, and about 280 tons is in circulation all the time the foundry is operating.

The castings are sorted according to size as they move through the cooling tunnel and directed to one of several Wheelabrator cabinets where they are bombarded with myriads of flying steel shot which removes the last vestiges of sand even from internal openings and imparts to them an attractive velvety sheen. Gates and sprues and other appendages that they acquired during the pouring process are then cut off, after which the castings are ground as required to give them their final contours. About 40 percent of them—and the quantity is gradually increasing—are next heat-treated to buyers' specifications in a tunnel-type furnace. They emerge softened, as desired, to facilitate the machining they will undergo in the customers' shops.

The GHR Division is turning out so-called precision castings on a limited scale, or what is termed an experimental-production basis. By the method used, accurate molds are formed around metal patterns with resin-bearing sand. When the resin is heated it binds the sand, thus producing shell molds that are placed in metal boxes and backed up with crushed rock to give them rigidity during pouring of the metal.




**MODERN COMPRESSOR**

This trim, compact, electrically driven machine was installed by Dayton Malleable Iron Company last year and has more capacity (1660 vs 1223 cfm) than the much larger and heavier 1909 unit pictured on the preceding pages. Of totally enclosed design, it has a vertical low-pressure cylinder and a horizontal high-pressure cylinder. The cylindrical vessel in the left background, which has a pipe connection to the compressor intake and another leading outdoors, is a Cycoil air filter manufactured by American Air Filter Company. It effectively removes the dust that is always found around a production foundry. The compressor is one of five machines installed in the company's GHR Division in Dayton, Ohio. They have a total capacity of 4960 cfm.

In vacating the older Dayton foundry, the company retired two steam-driven air compressors that had given long and faithful service. The larger one, which is illustrated, was an Ingersoll-Rand unit designated as Class A. It was built at Phillipsburg, N. J., in 1909 and sold to the National Military Home in Dayton, now a part of the string of hospitals run by the Veterans Administration. It was used there to pump water by the airlift method. After a while it was no longer needed for some reason and offered for sale. It was acquired for The Dayton Malleable Iron Company by W. B. Runyan who, at the time of his death in May, 1953, was chairman of the board. Previously he had served as president and vice-president in charge of operations. As near as can be determined, the machine was bought in the winter of 1913. There was snow on the ground, and the big piece of equipment, weighing somewhere around 34,500 pounds, was transported to its new location on horse-drawn sleds.

Despite its age, the compressor served the foundry well and efficiently and was retained through the years because of the working conditions that prevailed. Heat from the foundry melting furnaces, which was available without cost, was utilized to raise steam in waste-heat boilers, and it was therefore highly economical to continue using both steam-driven compressors. They are to be sold as scrap, and the metal will thus go on serving industry in some other form and some other field.

Typical DMI products are castings for truck-axle housings, manifolds for automobile and truck engines, frames for electric motors, roller-bearing housings for Pullman cars and diesel-electric locomotives, pump casings, cylinders for hydraulic presses, and compressor frames for household refrigerators. Most of the castings are small and few of them weigh more than 200 pounds. The value of the 1953 production was approximately $35 million.

The company has 3300 employees. Under the stepped-up technological and research program that has been instituted it has set up a graduate-engineer training course and obtains a steadily increasing number of new men from leading technical schools. In 1952 an employee pension plan was adopted and the Dayton Malleable Foundation was organized to administer the donation of funds to charitable and educational institutions. It was established with an initial appropriation of $60,000 and in 1953 received an additional allotment of $150,000.

# Editorials

## FAT MAN'S FOLLY

IT IS no longer news that industry is taking a continually growing interest in the health of its workers. Lately it has been delving into the subject of their avoirdupois. Calories are getting almost as much attention in some executive offices as horsepower and kilowatts. There's a sound statistical reason for this concern: records show that overheavy people do less work than those of normal weight, are involved in 15 percent more accidents and are more susceptible to certain diseases.

Fat persons are defined as those who are at least 20 percent over their "ideal" weight. There are many of them, and their ranks are swelling rather than declining —possibly because most people live much better than they used to. There are relatively few corporate figures available, but the *Wall Street Journal* reports that obese workers in the Pullman Company increased 115 percent between 1924 and 1940.

The question is what to do about the surplus-weight problem. It was suggested at a recent meeting of the Industrial Hygiene Foundation that group therapy perhaps offers the best approach. As it has been practiced for three years at Arlington (Pa.) Memorial Hospital, the procedure is something like that of Alcoholics Anonymous—that is, an effort is made to get the offenders to take the initiative in shedding their excess flesh. Members of a group meet, get a complete physical examination and regular medical advice. It is then up to them to exert the necessary will power to curb their appetites. Periodically they weigh one another rather than themselves to keep everybody conscious of the whole affair.

Physicians say that overeating is the sole cause of obesity in 95 percent of the cases they observe. The reasons people gorge are, however, not clearly understood. Some of the victims simply like to eat, of course, but we are told that most of them turn to food rather than alcohol or drugs as a means of relief from the strains, stresses and emotions generated by modern living.

Aside from the fact that surplus weight cuts down activity and shortens life, it appears that a roly-poly physique isn't always an indication of a happy, carefree individual. The branch of medicine known as geriatrics, which endeavors to help people achieve a happy and healthy old age, has dispelled long-held notions on this point. At the first geriatric symposium, which was held recently in New York, it was declared that even Shakespeare erred in his famous appraisal of human nature in *Julius Caesar*. Expressing a preference for sleek-headed fat men "and such as sleep o' nights," he declared that

> Yon Cassius has a lean and hungry look;
> He thinks too much: such men are dangerous.

Taking issue with the great bard, Prof. C. N. H. Long, chairman of Yale University Department of Physiology, reported that "fat men are not necessarily sleek or happy and they do not sleep well at night." The reasons cited are those already given: Instead of being at peace with themselves and the world, as is commonly thought, they actually have a distinct feeling of insecurity resulting from the complexities and frustrations of their daily lives and are seeking to overcome it. Rather than resort to alcohol and narcotics to relieve their inner tensions, they linger longer at the dining table and perhaps munch a few candy bars between meals.

To sum up, it seems that, in industry or life in general, there is still much truth in the old adage that recommends a lean horse for a long race.

## DIVERSIFIED INDUSTRY

BUSINESS and politics sometimes make strange bedfellows. You would hardly expect to find a national magazine and an oil company as partners, yet that has come to pass. Time, Inc., which produces four major general publications, and Houston Oil Company of Texas have formed East Texas Pulp & Paper Company to build a mill near Beaumont, Tex., that will turn out 300 tons of paper daily. Some of the output will, presumably, be used by the publisher, but a great deal of it will be converted into such heavy paper products as milk-bottle caps, cups, file folders and the like.

As may be readily surmised, the oil company is getting into the paper business by reason of its ownership of oil lands bearing timber suitable for pulping. Through a subsidiary, it will supply about half of the mill's input of 600 cords a day. As Houston controls 650,000 acres of timberland, it will be able to maintain this rate of cutting for a long time, and reforestation will take care of the distant future.

Equally interesting is the report that research is putting another processor of trees into the business of providing the oil industry with an important substance essential to the drilling of wells. Rayonier, Inc., known as the country's leading manufacturer of chemical cellulose from which rayon, cellophane and lacquers are made, has discovered a useful by-product in the pulping of hemlock trees. Called Rayflo, it is a reddish-brown powder that is an excellent dispersant or thinning agent for the fluids or muds used with rotary drill rigs.

Some years ago Holly Sugar Corporation got into the oil business when petroleum was discovered on land it owned in California, and it looks as though the same thing is about to happen to the St. Regis Paper Company, which has a large acreage of pineland in Florida on which some producing wells have been drilled.

More by design than accident, other companies are diversifying their activities or have already done so. Pullman Company, formerly associated solely with the railroad industry, has become a leading designer and builder of petroleum refining equipment through acquisition of M. W. Kellogg Company.

Gold-mining concerns in both the United States and Canada, having battled adversity for more than twenty years, are beginning to get into other fields. Both Homestake, of South Dakota, and Golden Cycle, of Cripple Creek, Colo., are mining uranium on the Colorado Plateau, as are also Climax Molybdenum, Anaconda Copper and various other important metal producers. U.S. Smelting and Sunshine Mining, the latter the nation's biggest silver-mining concern, have both gained a foothold in the oil business.

Numerous other examples might be mentioned. They all serve to show that industry apparently doesn't believe in putting all its eggs in one basket.

*Blazing Pigments*

# Signs That Glow in Daylight

DAYLIGHT fluorescent colors have stopped traffic throughout the United States and have elicited both official and editorial comment in the United Kingdom. The drab post-war vista there has been considerably dispelled by the blazing colors which represent the advertising industry's most exciting medium since the advent of neon lights more than a quarter of a century ago. The brilliance of these striking colors, which have already made their appearance in 34 countries, is the result of fluorescence, which is defined as the property of some materials to transform the short wave lengths of ultraviolet rays into the longer wave lengths of visible light.

The world's brightest colors can trace their beginnings to the curiosity and fertile mind of Joe Switzer, some twenty years ago an adolescent with a talent for legerdemain and an urge to act upon certain elementary knowledge gleaned from a scientific magazine. An article on black light, which he read in his father's Berkeley, Calif., drugstore, led him to improvise an ultraviolet lamp the same evening. He discovered that several drugs on the shelves glowed when exposed to the lamp's invisible rays and promptly proceeded to mix them with shellac to paint the props for his magic act.

A show-stopping performance before a Pacific Coast group of magicians helped spread the fame of the young entrepreneur whose brother, Bob, began to show signs of the administrative capacity that has led him to the presidency of Switzer Brothers, Inc., producers of fluorescent pigments known as Day-Glo. While Joe continued to make them, Bob began a direct-mail campaign. Willingly or not, even the boys' mother helped in the development of the business, for it was with the mixer from her kitchen that the showy paints and varnishes were blended in the family garage.

Struggling along in a makeshift way, the brothers sold their products to theatrical people and organizations such as the Golden Gate Exposition and the World's Fair. Following the purchase by a Cincinnati firm of an invisible ink for marking laundry, Joe, 19 years old, and Bob, 21, decided to head east for Ohio where they hoped to find a better market.

Obtaining places on someone else's payroll, they paid a chemist, Richard A. Ward, out of their earnings and set up a laboratory in a tiny apartment occupied by Joe, his wife and child. There he and the chemist developed a fluorescent black-light ink for lithographing theater, billboard and other posters. Among the early Switzer discoveries was an invisible fluorescent powder used by police in trapping criminals. Bob, the administrative half of the partnership, took time from his other responsibilities to invent and patent Zyglo and Magnaglo, substances for detecting minute flaws in metals by the use of black light.

Switzer's Day-Glo pigments are available in arc yellow, fire orange, saturn yellow, signal green and in neon and rocket red. The latter is brighter than any known red because, in addition to absorbing the red rays in the sun's spectrum, it converts the progressively shorter rays—orange, yellow, green, blue, violet, near-ultraviolet and ultraviolet—into long red rays, thus intensifying the brilliance of the original color easily 100 percent. When shorter rays predominate, as at dawn and sunset and on dull days, the glow of fluorescent colors may be up to four times as great as the brightest of nonfluorescent hues and seen from a distance as much as four times away.

There are scores of uses to which the more than 4000 licensees put the pigments turned out by Switzer's Cleveland, Ohio, pilot plant, which operates on a round-the-clock 7-day-week basis. Its luminescent products made possible the millions of yards of fluorescent cloth which became signal flags for the United States and Allied forces during World War II and the Korean conflict. Hunters are safer in the woods because of jackets made of fabrics which have been dyed in fluorescent colors; and if one is a duffer at golf, balls so painted will announce their whereabouts by blazing from the rough.

In the British Navy it is the practice to coat a rescue device—a marker buoy—with Day-Glo. Standard equipment on submarines, the buoy is released when a vessel of this type is trapped accidentally below the surface and leads rescue parties to the scene because its bright top attracts attention. This is a step beyond painting buoys and markers with Day-Glo to guide landing craft through mine fields and to rescue fliers adrift at sea or grounded in wilderness territory. Also during World War II battle

**SAFETY REMINDERS**

The brilliant colors of Day-Glo are effective vehicles for carrying safety messages. Bolstered by them, the upper poster is a real attention getter. Delivery wagons of the Borden Company in all parts of the country display on their dashboards the 3½x5½-inch safety message shown at the bottom. The letters are in brilliant saturn-yellow against a dark-blue background.

**BUGS WITH MESSAGES**

To dramatize the quality-control program in its Sharon, Pa., transformer plant, Westinghouse Electric Corporation puts 22x28-inch placards, like the one shown, on bulletin boards. Gaudy with Day-Glo colors, the bugs seem to come to life. Employees even take the posters home, something that has never before happened to a message from management.

zones received a steady flow of fluorescent maps, charts and manuals that could be read in the dark because they were printed with black-light inks.

Printers are making increasing use of paper coated with glowing colors far brighter than those obtainable with ordinary inks. The coating leaves the stock soft and pliable so that, with a few minor exceptions, it is as easy to handle as any premium paper. It is advisable to keep the cutter knife well sharpened and to back-trim the edges to prevent featheredging that might release tiny particles of the surfacing and spoil an otherwise perfect printing job. The impression can be further protected by an air blast directed on top of the stack at the feed end so any adhering particles can be blown off the sheets. Because fluorescent stock is somewhat heavier than other paper of like grade, lifts should be smaller. The added weight may also dictate adjustment of the feed in either letter-press or lithographic printing. Grippers or other mechanical contacts will not mar the coating, and fingerprints show no more than they do on ordinary paper.

Day-Glo can be had in silk-screen process colors, silk screen and spraying lacquers, and water and oil colors; brushing, flocking, bronzing powders and sizes; special compositions and in coated paper. Applications are expected to last for a minimum of 30 days under outdoor exposure, for a matter of months indoors and indefinitely under cover. The effect of the splashy colors is heightened by using nonfluorescent colors as a background—black, blue, green or dark brown offering maximum contrast.

Probably the newest Switzer laboratory product to burst upon the world is the Day-Glo letter-press ink which first appeared on the cover of a nationally circulated household magazine last May. Developed by the Interchemical Corporation, one of the company's licensees, the colors are available in a limited range of heat-set, moisture-set and regular oil inks. Also being introduced for flexographic presses is an aniline ink which, because of its limited lightfastness, is not suitable for work that will be exposed to the sun for any length of time.

In addition to posters, Day-Glo has been used successfully in transit advertising, point-of-sale and window displays; for direct-mail pieces, boxes and containers; and for magazine inserts, booklet covers, decals, banners, gummed labels and strips, novelties and greeting cards. Among these are excellent media for the dissemination of information of all kinds at trade shows, sales-program conferences, safety campaigns, library and museum exhibits, political meetings, educational gatherings, etc., in fact for any application where maximum visual impact is desired.

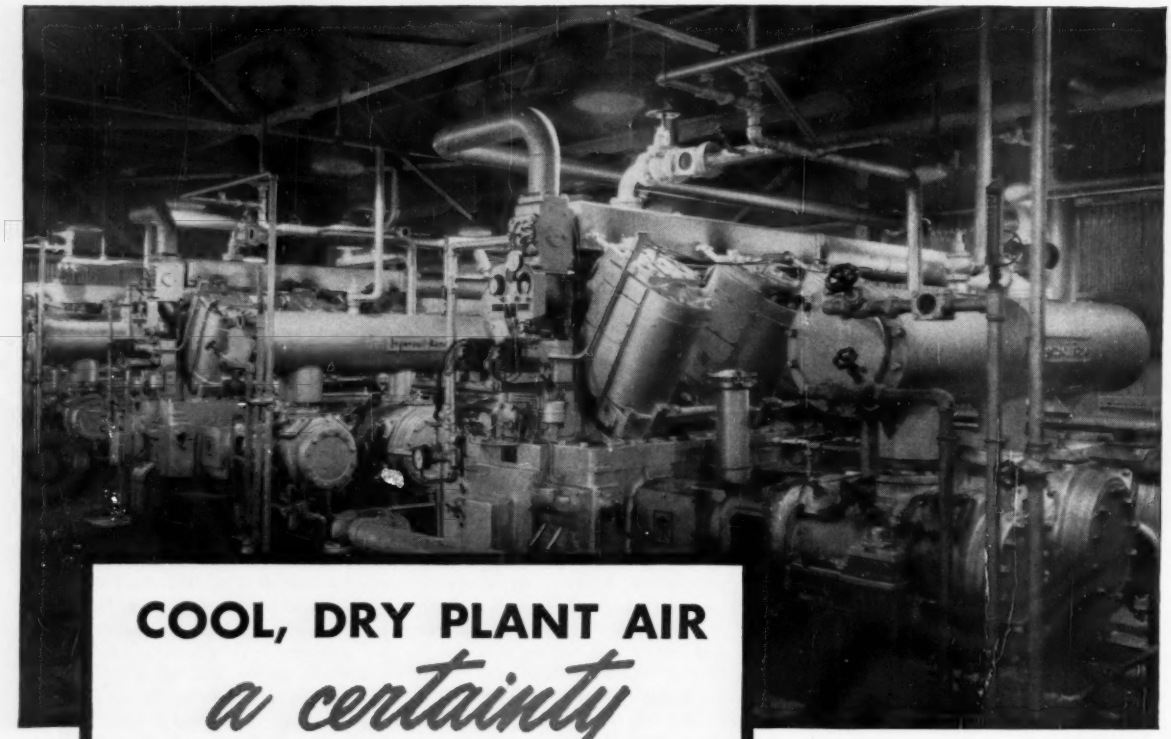
## Sonics and Electronics Serve to Blend Fuel Oils

ULTRASONIC energy and electronics have been harnessed for the purpose of automatically blending fuel oil for marine use. In reporting on the first successful field application of the new monitoring system, engineers of Minneapolis-Honeywell Regulator Company stated that it accurately blends light and heavy fuel oils in accordance with varying burner characteristics for high combustion efficiency. Though designed primarily for this service, the system can be used to package liquids.

By conventional methods, blending procedures are worked out in advance by mathematical calculations which fail to take into account certain factors that might throw off the figures. Under the new technique, the viscosity of the fuel oil is measured by a Bendix Ultraviscoson unit. Attached to the instrument is a probe which is inserted into the line carrying the final blend. The amount of energy absorbed by the fluid from the probe as it oscillates at high frequency indicates the viscosity. Because the latter changes with temperature, a compensating device, also designed by Bendix, is incorporated in the system. As the viscosity varies and is sensed by the probe, the information is transmitted to an electronic Honeywell regulator that opens or closes a valve and thereby automatically controls the flow of light fuel oil to the mixture to keep the viscosity at the predetermined value.

**PRICE TAGS ENCOURAGE GOOD CARE**

Believing that production workers will give the machines and tools they use better treatment if they know how much such things cost, Clark Equipment Company's Industrial Truck Division, at Battle Creek, Mich., makes this information available by a "price-tagging" system. The workman shown is continually reminded by the lettering on the equipment entrusted to him that it represents a $22,000 investment. Samples of small tools in common use are mounted on display boards and their prices are noted. The cost of tools purchased each month and the value of the tools broken also are posted regularly.



## COOL, DRY PLANT AIR *a certainty*

# ROSS Aftercoolers serve these I-R Compressors

On the job, but out of sight, in this Ingersoll-Rand air compressor installation at the Reynolds Metals Company Aluminum Reduction Plant, Gregory, Texas, are three Ross Aftercoolers . . . one for each of the 6SVG gas engine driven units supplying plant air.

In dozens upon dozens of other Ingersoll-Rand compressor installations . . . not only in industrial plants, but in numerous chemical plants, refineries and pipeline stations . . . you'll find the same team. Ross Aftercoolers are frequently the choice to work with I-R Compressors . . . just as they are the choice of other highly rated compressor manufacturers.

There are many solid reasons. Among them: (1) *Ruggedness*—the ability to "take-it" under all conditions. (2) *Thermal Efficiency*—unsurpassed by any other heat exchanger design. (3) *Standardization*—assuring prompt availability and economical manufacture. (4) *Engineering Cooperation*—Kewanee-Ross representatives have a reputation for helpful consultation and practical recommendations.

The design and structural advantages of Ross Aftercoolers, Cylinder Mounted Intercoolers, and Lube Oil Coolers have won the preference of compressor builders and users everywhere. Descriptive literature will be mailed to you, so that *you* can evaluate these advantages for yourself. Write.

**AFTERCOOLERS**

**INTERCOOLERS**

**LUBE OIL COOLERS**

ROSS

KEWANEE-ROSS CORPORATION

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

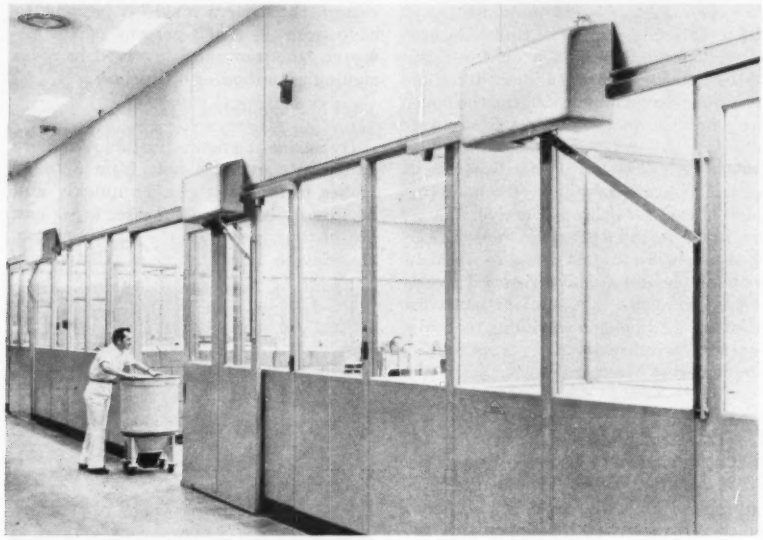
1471 WEST AVENUE • BUFFALO 13, N. Y.

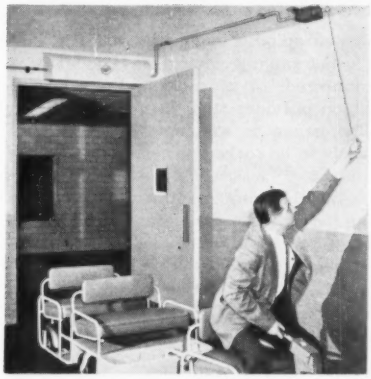
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

*Circle 35A on reply card*

# Industrial Notes





**TWO TYPES**

The swinging door at left is operated by pulling the cord. All-pneumatic operation and control increases safety in hazardous locations. Sliding doors (top) reduce heating and air-conditioning costs and speed flow of materials in a pharmaceutical plant.

## Improved Pneumatic Doors For Industrial Plants

A COMPACT door operator and control mechanism for service in industrial plants that can be put in place without expensive alterations is being made by the National Pneumatic Company, Inc. Called the Economatic, it comes prepiped, prewired and mounted on a base plate for easy installation. Mass produced but individually engineered to solve specific problems, it is reported to be the lowest-priced automatic door operator with built-in safety features ever offered. The latter include fully pneumatic control in areas where electrical connections would constitute a hazard and provision for manual operation in the event of power failure.

The mechanism can be actuated either automatically by a treadle or a photoelectric cell or semiautomatically by pushing a button, stepping on a switch, pressing a panel or pulling a cord. Whatever type is used, the door is always under complete control, the action of opening and closing being cushioned to prevent slamming that soon leads to damage. It is of advantage to plants to have doors that respond instantaneously, for that means faster movement of men and materials, cuts heating as well as air-conditioning costs and, in the case of fire doors, offers surer protection against the spread of flames.

*Circle 1E on reply card*

Du Pont's Teflon is being transformed into a filtering material by a sintering and molding process developed by Porous Plastic Filter Company. It is said to be suitable for both gases and liquids, including acids and caustic and organic solvents, and to remove particles as small as 1 micron from gases and 3 microns from liquids. A maximum flow capacity of 45 gpm per square foot of area at 5 psi differential pressure is indicated with organic fluids having about the same viscosity as water. Porous Teflon is nonabsorbent and retains the high corrosion and heat resistance of the parent material. It is available in disk form in diameters up to 12 inches with a solid Teflon rim for strength.

*Circle 2E on reply card*

**with this WISCONSIN-POWERED UNIT!**

This sturdy unit takes a six-foot-wide bite in any kind of snow, loading from 7 to 12 cubic yards of snow per minute in trucks or throwing it clear. Builder is Krause Industries, Baraboo, Wisconsin and the snow blower is constructed to mount easily and quickly on the Hough Payloader Tractor-Shovel. A Wisconsin Heavy-Duty Air-Cooled Engine provides the power.

Equipment builders and buyers are choosing Wisconsin Engines over all other types in the 3 to 36 hp. range . . . as the most satisfactory and foolproof power to fit both the *job* and the *machine*. You'll find a model and size available to fit every power requirement . . . 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 36 hp. Write for Bulletin S-164.

MOST H.P. HOURS

**WISCONSIN MOTOR CORPORATION**

*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

MILWAUKEE 46, WISCONSIN

A 8121-1/5

*Circle 10A on reply card*

## New More Powerful Electric Impactool

TO ITS line of rotary electric tools, Ingersoll-Rand Company has added the new Size 5U Impactool, which is said to carry more power than any other similar tool of its size and weight. Designed to meet with ease the nut running requirements of high-compression, high-torque automotive engines, it has a ½-inch drive, weighs only 6¼ pounds, is 10¼ inches long over-all, and capable of delivering 1900 impacts a minute. It will operate on either 110 or 220 volts, ac or dc (60 cycles or under).

The tool's extra power not only insures fast and tight application of all nuts and bolts within its rated capacity but also speeds up universal joint and angle head jobs and other equally difficult operations. An additional feature is the replaceable, synthetic-rubber bumper which can be snapped on the front of the housing, preventing dirt from entering the driver and protecting the housing when the tool is used in close quarters.

Although designed primarily for service in the automotive field, this new Impactool can be utilized wherever fasteners must be applied or removed. In addition, it is a multipurpose tool which, with simple and quickly installed standard attachments, can be made ready for masonry drilling, screwdriving, reaming, tapping, wirebrushing or woodboring, among other things.

*Circle 3E on reply card*

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An electronic testing system that will permit engineers to estimate in advance of installation what effect additional equipment in a department will have on its operation was developed by Minneapolis-Honeywell Regulator Company to meet its own needs but is now available to industry. Known as Servo Analyzer, it automatically measures the behavior characteristics of machinery and plots the result on a chart. This record, in turn, is analyzed to determine how the component will affect the behavior of the equipment as a whole. On the basis of 10,000 man-hours of investigation in the firm's servomechanism laboratory, the system makes it possible to save from 30 to 60 percent of the research time normally involved in redesigning a method of operation.

*Circle 4E on reply card*

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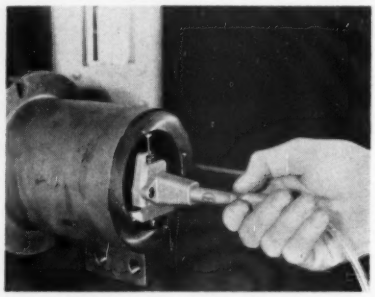
By means of a new adjustable Airebore gauge kit, any size hole from 3 to 12 inches in diameter can be quickly and accurately inspected for size, taper and out-of-roundness. As the picture shows, the device consists of a triangularly



shaped spindle body with an attached Plunjet gauging cartridge. The latter is connected to a column Precisionaire which provides 1000 to 1 amplification. The gauge is self-centering and only needs to be rocked to ascertain the true diameter of a bore. It is used with interchangeable components such as a centering foot, handle connector, length extensions and an adjustment screw. The kit is manufactured by The Sheffield Corporation.

*Circle 5E on reply card*

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Measuring small flat surfaces is simplified by a 20-inch Griswold Huet optical straightedge available heretofore only in 5- and 10-foot lengths. It requires no elaborate setup and is said to measure deviations as minute as 0.000025 inch. A prism-and-lens housing resting on two metal blocks over the work per-

Lehigh INC.

A COMPLETE LINE OF AIR CONTROL EQUIPMENT

Including precision-made HEAVY-DUTY

AIR MOTORS

WITH "SEALED-IN LUBRICATION" Pat. Pend.

Wide choice of electric and/or air controls and mountings. For air pressures up to 200 P.S.I. Standard bores 1½"—2"—3". Any desired stroke. Larger bores on special order.

"Sealed-in Lubrication" Assures low break-away on long idle units — ample sealed-in oil for thousands of cycles without attention.

"Sealed-in Lubrication"

AIR CYLINDERS 1½" to 8" bore

3 or 4-Way AIR POWERED VALVES

Air or electrically operated. J.I.C. Standards.

You Are Invited To Consult Our Engineering Department freely on all air automation or replacement problems. Trained factory personnel available nationally.

Write for Catalogs and Name of Nearest Lehigh Representative

COMBINATION VALVES Panel units, hand and foot operated valves. Wide range of models.

Lehigh Minor AIR VALVES and CYLINDERS

Low priced, light duty. For air operated jigs, fixtures, high speed operations.

Lehigh INC.

ENGINEERS & MANUFACTURERS

1513 Lehigh Drive

EASTON, PENNA.

*Circle 11A on reply card*

mits a precision "feeler" microscope with built-in illumination to ride along the machine-tool table, flat bed, slideway, cylinder, etc., under examination. Deviations observed through the microscope are indicated by the relative positions of two indices and converted into linear measurements by reference to a micrometer.

*Circle 6E on reply card*

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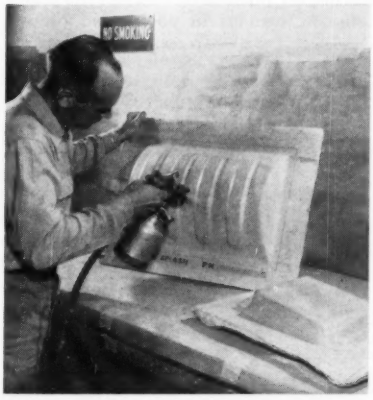
Foundry supervisors at Temco Aircraft Corporation recently found the answer to a troublesome problem in the strippable vinyl-base coating which is sprayed on aluminum sheet stock to protect it during handling, forming and riveting. In making plastic dies in plaster molds, traces of moisture remaining in the latter even after eight hours of oven-drying seeped into the freshly cast material. The moisture in itself is not harmful, but when a chemical accelerator is added at the time of pouring, the plastic reaches a temperature of 200°F for a few minutes, and this causes the moisture to vaporize with resultant imperfections and pits, often ⅛-inch deep, in the soft plastic. Now foundry workers spray one coat of Delco Chemicals' X-2000 sealer on each mold, sand it lightly after drying, and then cover the surface with wax. Moisture




will not penetrate this seal, and it is said that dies so produced require no finishing operations. Since the process was introduced the foundry has saved five man-hours per day.

*Circle 7E on reply card*

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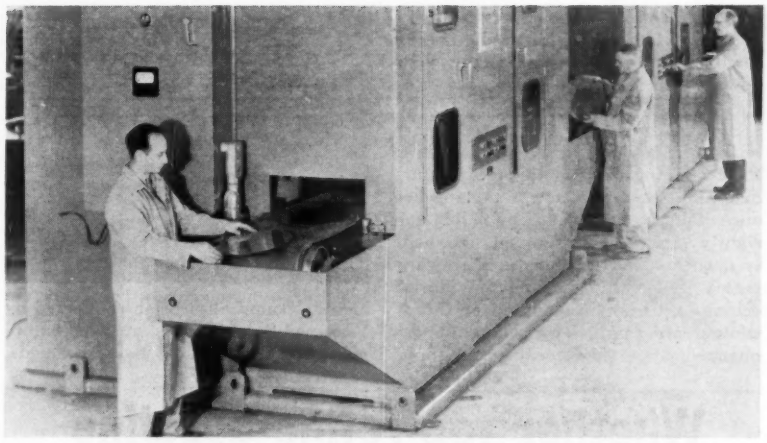
Radium emanations or radon is being used by the Ericsson Telephone Company in Sweden to localize leaks in cable systems. The method is simple and inexpensive because the gas is already serving curative purposes and can be bought at low cost from hospitals. For the service in question, it is put in a small vial about 0.4–0.8 inch long and 0.04 inch wide. This is inserted at one end of the cable or at a junction and crushed, thus releasing the radon which is carried along in the form of a bubble by the gas that circulates inside the cable. After a lapse of about half an hour, a radiation detector is put to work. The latter is connected with an indicator in a holder slung around the neck of the trouble shooter, who walks along the system holding the detector, in a bag, just above the ground. The presence of the radon in the cable is continually recorded on the instrument's scale, which is in plain



**GRINDING ON THE MOVE**

Metal pieces fed into this 35-ton machine are carried on a Neoprene conveyor under four grinding heads equipped with progressively finer grinding belts. Rubber hold-down rolls and powerful permanent magnets prevent the blanks from slipping during the operation. The conveying speed can be varied from 15 to 60 feet per minute, and the heads can be adjusted for stock of different thicknesses. Built by the Curtis Machine Corporation, the machine is used by a motor-car manufacturer for prefinishing automobile bumperettes before forming them.

*Circle 8E on reply card*

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**Stockpiling Simplified**

**¾-YD. SAUERMAN SCRAPER HANDLES ILMENITE AT 25 TPH**

A Sauerman Scraper machine was selected to achieve profitable material handling by a large Eastern manufacturer of chemical products. Rapid shifting of the scraper about the 146′ by 311′ storage area is accomplished by a monorail and trolley system. The scraper is controlled by one operator who is in a safe location overlooking the storage area. He can reclaim the ore directly from the unloading trestle to the plant for processing, or he can stockpile the material until it is needed. Write for Field Report 224 describing this installation in detail. Find out how to reduce your storage cost.

Contact Sauerman now on the best system for your requirements. For more information write for *32 Tested Methods of Handling Bulk Material and Catalog E, Scraper Storage.*

**SAUERMAN BROS. INC.**

628 S. 28th Ave. | BELLWOOD, ILL.

*Circle 12A on reply card*

view of the operator, but when the point of leakage is reached the needle makes that fact known by an especially wide deviation from zero.

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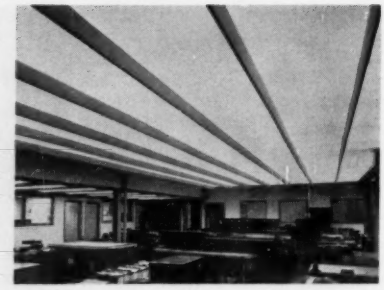
Sylvan-Aire, a new wall-to-wall lighting system designed by Sylvania Electric Products, Inc., is said to provide soft, over-all illumination, add to the appearance of offices, stores, etc., by hiding unsightly pipes and equipment and help to deaden sound. The fixtures are concealed by a white, corrugated plastic ceiling and may be mounted on 3-foot centers conforming to the ceiling support channels or spaced according to requirements. Sound absorption is effected by V-shaped Sono-Wedges, optional equipment, lined with thick glass-fiber pads.



These may be added later, without difficulty. The system permits quick access to service facilities.

*Circle 9E on reply card*

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For users of industrial packings, especially those whose requirements are limited, New York Belting & Packing Company, 1 Market Street, Passaic, N. J., has worked out a selector which enables them in seconds to pick out the one best suited for any gasket, valve-stem, centrifugal- and reciprocating-pump application. It may be obtained without charge by writing request on company letterhead.

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Carbon-bonded silicon-carbide crucibles should be used with pedestal blocks made of the same material, according to engineers of Electro Refractories & Abrasives Corporation. They point out that when both have the same coefficient of expansion the incidence of cracks caused by strains is minimized and the possibility of undesirable reactions is lessened. The blocks will not soften, spall or slump at normal furnace temperature.

*Circle 10E on reply card*

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For the first time, we are informed, there is available a standard receiver recorder for pneumatic and electric transmission systems in power and process

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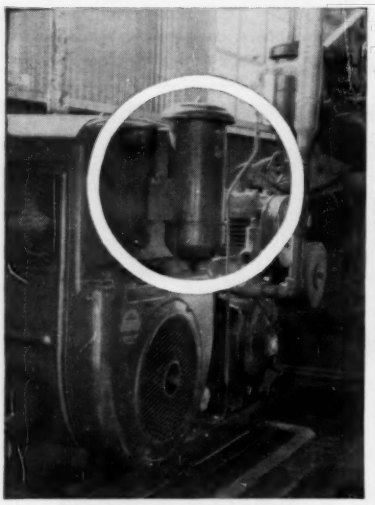
# Whether you refine gasoline or build the roads it's used on...

## *Air Maze filters will keep your compressors on the go!*



**TO KEEP THIS COMPRESSOR SUPPLYING AIR** at the Union Sulphur Gasoline plant, Runnells County, Texas, an Air-Maze oil bath filter is used. It scrubs intake air clean in a bath of oil. It keeps airborne dirt from damaging polished pistons, rings and other vital compressor parts. It reduces maintenance costs and downtime.

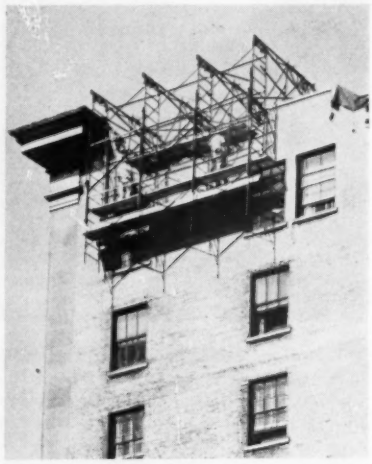
**WORKING IN THE MIDST OF DUST AND DIRT** on the New York to Buffalo Thruway, this compressor needs clean intake air to prevent serious breakdowns. And it gets clean intake air with an Air-Maze oil bath filter! It reduces engine overhaul costs which could be extremely high in such a heavy dirt concentration. Specify Air-Maze filters on the compressors *you* build or buy.

**AIR-MAZE** The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

25000 Miles Road • Cleveland 28, Ohio

*Circle 13A on reply card*

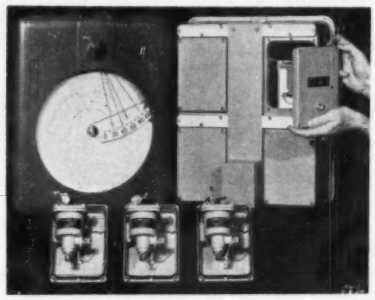



**HANGING SCAFFOLD**

When wall repairs were needed near the top of the 9-story Hanna Building Annex in Cleveland, Ohio, a scaffold for workmen was hung over the parapet rather than build it up from the street. This saved the masonry contractor $1500 and eliminated 90 percent of the staging that would otherwise have been needed. The Waco steel scaffolding was suspended from 22-foot outriggers cantilevered from the parapet and weighted down with 4000 pounds of bagged sand to counterbalance the hanging section, which extended 19½ feet down the face of the building.

*Circle 11E on reply card*

plants that will keep continuous, independent records of one to four measured variables. Designed for panel mounting, the units, shown in the accompanying illustration, are plugged into the rear of



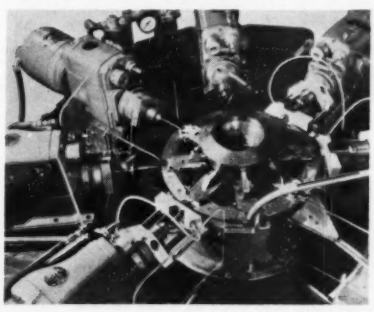
the casing (upper right) and may be interchanged. Two plug-in escapement-type integrators with flow records may be added to the same casing. Readings are traced on charts with stainless-steel fountain pens which obtain their supply of ink from hermetically sealed sacs that hold enough to last a year, it is claimed. The recorder is made by the Bailey Meter Company and was introduced at the First International Instrument Exposition held in Philadelphia, Pa.

*Circle 12E on reply card*

Edison Storage Battery Division of Thomas A. Edison, Inc., has introduced a nickel-iron battery—the "MC"—that, it is claimed, gives 25 percent more power in approximately the same space as its predecessors. The unit is "tailor-made" for the materials-handling field—specifically for use in lift trucks where power requirements are high but space is limited. It is 2½ inches higher than the "C" Type now in use but usually fits into the latter's battery box.

*Circle 13E on reply card*

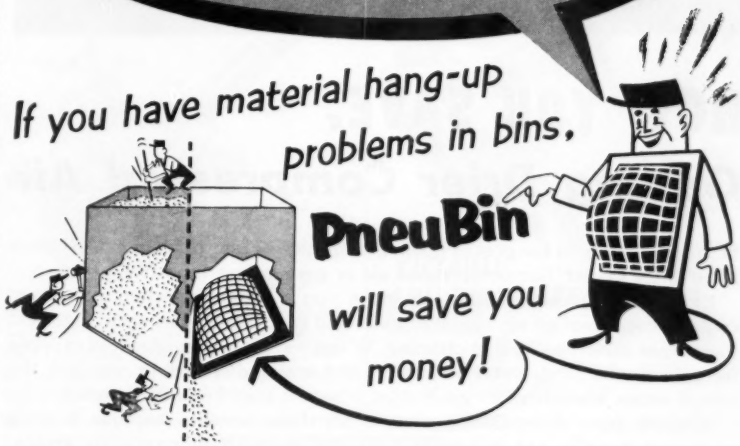
To make its standard air-hydraulic drill units highly flexible, Rockwell Manufacturing Company has designed a line of sliding subbases and now has three in production, one for each size drill. By use of this accessory, special-purpose machines incorporating these units can be built so that the latter can be moved forward or backward in relation to the machines without loss of alignment. Further, the bases reduce down time because they facilitate repair or removal and replacement of tools and because adjustments in setup from one job to another can be made without disturbing alignment. The smallest of the models has a length of travel of 4⅛ inches and each of the two larger ones 6 inches.



*Circle 14E on reply card*

Davies Brothers, sole United States representative for the Airhydropump manufactured in England by Charles S. Madan & Company, Ltd., has announced a new single-acting model with a ratio of 690 to 1. With air at 100

PULSATING PANELS
eliminate flow stoppage in bins!



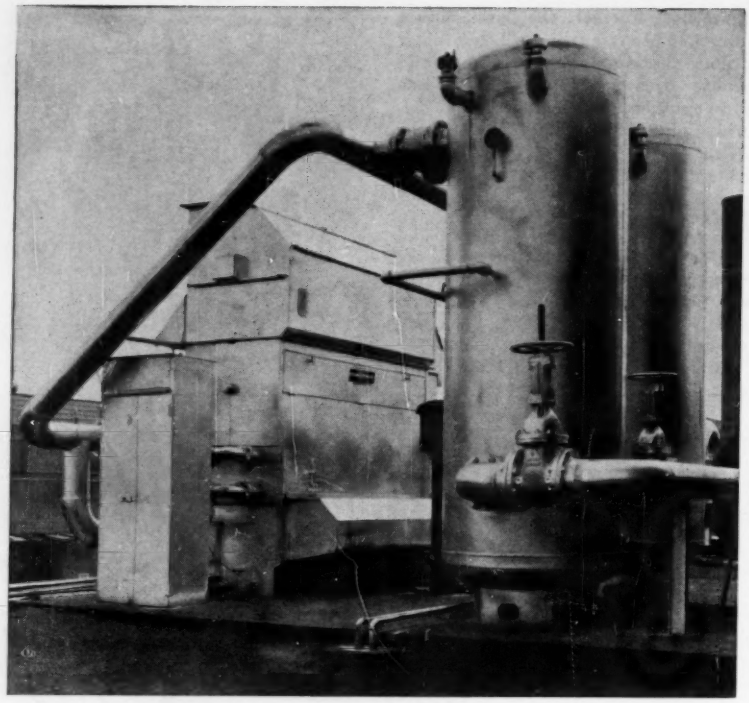

**PneuBin** will solve your flow stoppage problems and reduce your operating expense. The PneuBin unit consists of steel-backed, neoprene, pulsating panels mounted on the inside wall of your present bins and air controls to regulate the panels' action. By the pneumatic inflation and deflation of the PneuBin panels, the bin contents are positively displaced to insure free flow. After the panels have deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues *automatically* at whatever frequency is set on the air controller (this frequency is adjustable).

PneuBin decreases plant operating costs by reducing maintenance, insures constant material flow to production lines and greatly increases personnel efficiency through its quiet operation.

*Send for "Flow Stoppage Report" and FREE literature. PneuBin engineers will gladly make recommendations with no obligation on your part.*

PneuBin
A PRODUCT OF
GEROTOR MAY CORPORATION
1531 Maryland Ave., Baltimore 3, Maryland

*Circle 14A on reply card*



# HOW YOU SAVE,
## *Getting Drier Compressed Air*

● Direct saving in the cost of cooling water saves the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, the drier air gives you a better operation and lower costs in the use of all air-operated tools and machines, paint spraying, sand blasting or moisture-free air cleaning. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara Aero After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter by the Niagara Balanced Wet Bulb Control.

*Write for complete information; ask for Bulletin No. 98*

**NIAGARA BLOWER COMPANY**

Dept. CA 405 Lexington Ave. New York 17, N. Y.

*Niagara District Engineers in Principal Cities of U. S. and Canada*

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

*Circle 15A on reply card*

pounds pressure, it is believed to be the only pump of its kind to develop hydraulic pressure of 60,000 psi. It comes to rest automatically when the desired pressure is reached and holds it without consuming more air. Any intermediate pressure can be obtained by turning the air-control valve, which is an integral part of the unit. In case of leakage in the system, the pump will continue to work and compensate for the loss. Thirty-four standard single- and double-acting models are available.

*Circle 15E on reply card*

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Neoprene and nylon have been successfully bonded by Du Pont into a material trade-named Fairprene that is especially suitable for making tarpaulins. Two years and more of field tests on trucks have proved that the protective covering does not shrink or absorb moisture; can be stored wet for long periods without mildewing or rotting; does not stiffen appreciably in freezing weather; is highly resistant to grease, oil, most chemicals and sunlight; has exceptional tear strength; and can be vulcanized (repaired) as readily as a tire tube. It is available in different grades: the lightest one, recommended for blanketing athletic fields, weighs 9 ounces a yard. The nylon is coated on both sides with the synthetic rubber by a patented process developed by the company's Fabrics Division which is said to insure lasting adhesion. Another advantage of Fairprene, according to truck owners, is that the driver can handle and stow a tarpaulin of average size without assistance.

*Circle 16E on reply card*

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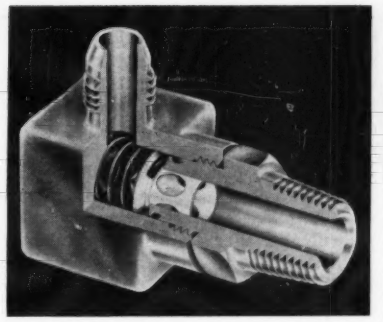
To meet a demand, James-Pond-Clark has developed a right-angle check valve that has all the characteristics of its standard in-line 200 Series but that

**STEP IN MAKING ELECTRODES**

At the new welding electrode plant of Westinghouse Electric Corporation in Montevallo, Ala., manufacturing starts with hot-rolled wire. It is first descaled by passing it through a series of rolls to bend it sharply; then the loosened scale is blown off with compressed air; and after that the wire is drawn to size through dies such as those shown.



will fit into a system in a limited space. The P-602 is of the same chatter-free, zero-leakage design as the company's other circle seal valves but in many cases will simplify line arrangement and installation.

*Circle 17E on reply card*

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One material that performs four functions has been announced by Owens-Corning Fiberglas Corporation. This new product, known as Acoustical Form Board, may serve as a permanent roof decking, as roof insulation and, on the interior of industrial, commercial and school buildings, as a sound absorber and as an incombustible ceiling. It has a pleasing mat face, is light in weight, easy to install, dimensionally stable and will not rot because the glass fibers are unaffected by moisture. The porous board has a noise-reduction coefficient of 0.75.

*Circle 18E on reply card*

## QUOTES

*—FROM HERE AND THERE*

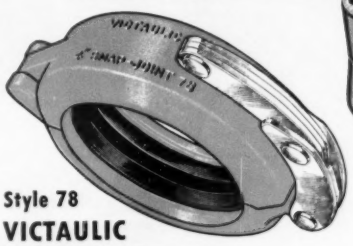
### Tubeless Future

"Tubeless tires, their manufacturers say, are here to stay, and within a few years inner tubes will be a thing of the past, to be found only in automotive museums along with running boards and carbide lamps. Doubtless that is progress, but do the tire makers realize that elimination of the inner tube is going to cause a drastic revolution in the American way of life?

"Holding air in a vehicle tire is only the initial use of an inner tube, and sometimes only a minor and incidental one. After serving this original function, the average inner tube passes on, often much patched, to a wide range of general utility. For one thing, we don't see how the next generation of children will learn to swim without the aid of old inner tubes. A generous supply of lightly inflated inner tubes is always to be found around beaches, docks, and swimming holes, where they serve admirably as economical life preservers and give countless middle-aged ladies a sense of security that enables them to wade out to armpit depth.


# VICTAULIC
## METHOD OF PIPING

**FOR GROOVED PIPE**



Style 78
**VICTAULIC SNAP-JOINT**

New, boltless coupling — hand-locks — for faster hook-ups with no loose parts. Ideal for temporary or permanent lines. Sizes 1", 1¼", 2", 3", 4".

Style 77 & 77-D

**VICTAULIC COUPLINGS** Style 75

Style 77 & 77-D—The "general-purpose" couplings for standard applications. Simple, fast, reliable—sizes ¾" to 60".

Style 75—Light Weight Couplings—for low pressure, low external stress applications. Sizes 2", 3", 4".

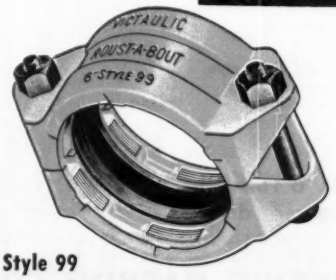
**VIC-GROOVER TOOLS**

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle, operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

**VICTAULIC FULL-FLOW FITTINGS**

Streamlined for top efficiency, easy to install—complete line, Elbows, Tees, Reducers, Laterals, etc., — fit all Victaulic Couplings. Sizes ¾" to 12".

**FOR PLAIN END PIPE**




Style 99
**VICTAULIC ROUST-A-BOUT COUPLINGS** Best engineered, most useful plain end joint on the market! Simple, fast, husky. Easy to install with any socket wrench. Takes strong, positive, bull-dog grip on pipe. Sizes 2" to 8".

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog and Engineering Manual No. 54-8B

**VICTAULIC COMPANY OF AMERICA**
P. O. Box 509 • Elizabeth, N. J.

**EASIEST WAY TO MAKE ENDS MEET!**

*Circle 16A on reply card*

**More and more mechanics say...**

**Get a "TOLEDO" and you get the Best!**

# TOLEDO

## Heavy Duty PIPE WRENCH

- ★ Unconditionally Guaranteed
- ★ Single Spring—gives quicker, easier setting
- ★ Replaceable Jaws
- ★ Improved Hand-Grip
- ★ Sizes 6" to 48"

Order from your supplier today.

## *Need a Good PIPE CUTTER?*

⅛" to 2" pipe

Try the new TOLEDO No. 20 with 6 rollers—recommended for use with power drives —works fine by hand, too.

**THE TOLEDO PIPE THREADING MACHINE CO.**
Toledo 4, Ohio

Builders of the World's Finest Pipe Tools

"TOLEDO" TRADE-MARK REGISTERED U.S. PAT. OFFICE

PIPE THREADERS
PIPE WRENCHES
POWER PIPE MACHINES

*Circle 17A on reply card*


"The world's chief supply of sheet rubber for farm and home use will disappear with the inner tube. Every do-it-yourself hobbyist has an old inner tube hanging conveniently in his garage or workshop, from which he can carve hunks for an improvised washer, boot patch, or pad. A piece of inner tube will stop a rattle in a jalopy, weatherstrip a door or window, make a spring for a screen door, provide hinges for a box lid, patch a hot-water bottle, protect a boat gunwale, pad a mallet head, keep a rainspout from splashing, deaden a door bell, absorb the vibration of mechanical equipment, and keep a bookend from skidding on a desk top. Cross-sections make big rubber bands.

"The world is going to miss the inner tube. And what will small boys do for slingshots?"

*Henry D. Ralph in Oil & Gas Journal*

### Pneumatic Spooler on Oil-well Rigs

"Unwinding cable from a drum at varying speeds without fouling the line is the key to successful winch operation. To oil well drillers, rig time is dollars. The quicker the 'down hole' trip is made . . . the less the job will cost.

"As long as the centerline of the winding drum on the truck is in the same plane as the centerline of the oil well casing, the reel line will wind and unwind evenly without any level device. However, under many conditions the centerlines are not in the same plane. This may happen when the truck is on uneven ground, or in the case of off shore drilling work the barge may be pitching . . . .

"To prevent uneven spooling, it had been necessary to have a man stand next to the sheave wheel on the truck. He pushed or pulled the sheave wheel as required to cause the line to lay evenly. Not only did this method cause slow down in drum rotation, it was also very dangerous for the man pushing the wheel.

"Replacing the man with a mechanical shifting device, required a simple lever and a method of controlling the push. Also the device would have to free wheel or coast when not being used. An air actuated lever . . . was selected because of the reliability of air and the ease of adapting air to the equipment. Since a 130 psi compressor is standard equipment on perforating trucks, no additional power source was needed.

"With this line spooler (positioned by a clevis-mounted pneumatic cylinder) it has been possible to spool as fast as 800 fpm when the reel drum is as much as 12 feet off center. Adjustment of a pressure regulator controls the line spooler. The device has worked well. With the installation of a lubricator-filter, the air circuit has required little maintenance."

*Applied Hydraulics, March, 1954*

## Books and Industrial Literature

The third edition of *Conveyors and Related Equipment* by Wilbur G. Hudson, just published, is a profusely illustrated 524-page book covering every phase of materials handling and storage and written with the architect, consultant and plant as well as student engineer in mind. It contains much new material on belt construction and Dynamatic drive control; designs of bunkers, bins and silos; boiler-house coal handling and storage; hydraulic transportation of coal in pipe lines; pneumatic conveying and air flotation which, respectively, have made it possible to transport flour in bulk and increase the cement-carrying capacity of ships; dust-explosion hazards, etc. The volume is divided into 22 chapters which, in addition to discussing the applications and limitations of the various types of materials-handling equipment, deal with crushers, hammermills and pulverizers; screens, feeders and gates; weighing devices and methods; and drives (motors, chains, etc.). The author has spent most of his life in the field covered and for some time headed his own firm, Wilbur G. Hudson Corporation. Since 1943 he has been a consulting engineer specializing in materials handling. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, $9.00.

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The new Electrotherm Model 453 pneumatic platen press for industrial plastic welding applications is described in Form P554 released by the Electronic Processes Corporation.

*Circle 19E on reply card*

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Bulletin 103 describes The V.D. Anderson Company's Hi-eF purifiers (scrubbers) designed for the delivery of clean vapor and gases from steam drums, flash tanks, evaporators, packed and bubble-cap towers, etc.

*Circle 20E on reply card*

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Bulletin No. 497 describes T.B. Wood's new variable-speed drive designed to use a single wide-range belt for maximum efficiency. It also shows how to design and select drives for motors from 1 to 20 hp.

*Circle 21E on reply card*

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A 4-page folder now available discusses the advantages of the King Portable Brinell Hardness Tester that may be bench mounted or carried to the job and used in any position to test parts of any size.

*Circle 22E on reply card*

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Bulletin No. 2022 published by Armstrong Machine Works tells how to select and install its air traps for the automatic drainage of water from compressed-air intercoolers, aftercoolers, receivers, separators and drip points.

*Circle 23E on reply card*

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General Electric Company Bulletin GEA-6180 provides information on the design, operating features and ratings of its new "B" case Speed Variator power unit, a packaged all-electric adjustable-voltage d-c drive operating from a-c power.

*Circle 24E on reply card*

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J. N. Fauver Company, Inc., offers a revised 6-page catalogue on its automatic conveyor lubricators. Identified as No. CL849, it includes a supplement describing its new 700 series which handles either grease or oil and applies a controlled quantity under air pressure to every trolley-wheel bearing and chain link pin every trip.

*Circle 25E on reply card*


Two-wheeled Ingersoll-Rand GYRO-FLO 210 compressor, powering paving breakers on U.S. No. 1 in New Jersey.

... EMBLEM OF DEPENDABILITY ...

**INDUSTRIAL GASOLINE ENGINES**

| Model | Cyl. | Bore | Stroke | Displ. | Bare Engine H.P. |
|---|---|---|---|---|---|
| N56 | 4 | 2¼ | 3½ | 56 | 14.2 @ 2200 RPM |
| N62 | 4 | 2⅜ | 3½ | 62 | 15 @ 2200 RPM |
| Y69 | 4 | 2½ | 3½ | 69 | 21.4 @ 2400 RPM |
| Y91 | 4 | 2⅞ | 3½ | 91 | 28.5 @ 2400 RPM |
| Y112 | 4 | 3 3/16 | 3½ | 112 | 32 @ 2400 RPM |
| F124 | 4 | 3 | 4⅛ | 124 | 36 @ 2400 RPM |
| F140 | 4 | 3 3/16 | 4⅛ | 140 | 42 @ 2400 RPM |
| F162 | 4 | 3 7/16 | 4⅛ | 162 | 49 @ 2400 RPM |
| F186 | 6 | 3 | 4⅛ | 186 | 60.5 @ 2400 RPM |
| *E201 | 4 | 3⅝ | 4⅛ | 201 | 59 @ 2000 RPM |
| F209 | 6 | 3 1/16 | 4⅛ | 209 | 68 @ 2400 RPM |
| F226 | 6 | 3 5/16 | 4⅛ | 226 | 73 @ 2400 RPM |
| F244 | 6 | 3 7/16 | 4⅛ | 244 | 79 @ 2400 RPM |
| M271 | 6 | 3⅝ | 4⅛ | 271 | 86.2 @ 2400 RPM |
| M290 | 6 | 3¾ | 4⅛ | 290 | 92.2 @ 2400 RPM |
| M330 | 6 | 4 | 4⅛ | 330 | 104.4 @ 2400 RPM |
| M363 | 6 | 4 | 4 13/16 | 363 | 109 @ 2000 RPM |
| B371 | 6 | 4⅛ | 4⅝ | 371 | 110 @ 2400 RPM |
| B427 | 6 | 4 5/16 | 4⅞ | 427 | 127 @ 2400 RPM |
| G134 | 4 | 3½ | 4⅛ | 134 | 32.2 @ 2000 RPM |
| G157 | 4 | 3⅜ | 4⅛ | 157 | 37.7 @ 2000 RPM |
| H227 | 4 | 3⅝ | 5½ | 227 | 52 @ 1800 RPM |
| H243 | 4 | 3¾ | 5½ | 243 | 56 @ 1800 RPM |
| *H260 | 4 | 3⅞ | 5½ | 260 | 60 @ 1800 RPM |
| T371 | 6 | 4⅛ | 4⅝ | 371 | 119 @ 2400 RPM |
| *J382 | 4 | 4½ | 6 | 382 | 74.2 @ 1400 RPM |
| T427 | 6 | 4 5/16 | 4⅞ | 427 | 140 @ 2400 RPM |
| U501 | 6 | 4½ | 5¼ | 501 | 160 @ 2400 RPM |
| R513 | 6 | 4½ | 5⅜ | 513 | 164.3 @ 2400 RPM |
| R572 | 6 | 4¾ | 5⅜ | 572 | 182.4 @ 2400 RPM |
| R602 | 6 | 4⅞ | 5⅜ | 602 | 191.7 @ 2400 RPM |
| S749 | 6 | 5⅛ | 5½ | 749 | 217 @ 2200 RPM |
| S820 | 6 | 5⅜ | 5½ | 820 | 237 @ 2200 RPM |

**INDUSTRIAL DIESEL ENGINES**

| Model | Cyl. | Bore | Stroke | Displ. | Bare Engine H.P. |
|---|---|---|---|---|---|
| GD157 | 4 | 3½ | 4⅛ | 157 | 39 @ 2000 RPM |
| *ED201 | 4 | 3⅝ | 4⅞ | 201 | 45.8 @ 2000 RPM |
| HD243 | 4 | 3¾ | 5½ | 243 | 54.7 @ 2000 RPM |
| *HD260 | 4 | 3⅞ | 5½ | 260 | 59.3 @ 2000 RPM |
| *JD382 | 4 | 4½ | 6 | 382 | 72.5 @ 1600 RPM |
| TD427 | 6 | 4 5/16 | 4⅞ | 427 | 106.5 @ 2000 RPM |
| RD572 | 6 | 4¾ | 5⅜ | 572 | 142.5 @ 2000 RPM |
| SD802 | 6 | 5 9/16 | 5½ | 802 | 202 @ 1800 RPM |

*Available for industrial applications only.

ON THE ENGINE OF LEADING MAKES OF:

Pumps ... Compressors ... Shovels
Cement Mixers ... Graders
Earth Movers ... Ditchers ... Rollers
Well Drillers ... Paving Machines
Winches ... Hoists ... Conveyors
Industrial Trucks ... and other
Specialized Power Equipment

When choosing construction machinery, always remember that the leading makes of specialized equipment for every operation, from excavation on through final grading, offer the plus value of dependable Red Seal power. And Red Seal *means* plus value, because every model, no matter in what machine you find it, is engineered with the specific needs of that machine in mind. Red Seal industrial engines—14 to 237 horsepower—are backed by parts and service coast to coast. Look for the Red Seal Trademark on the engine of the equipment you choose.

• • •

6 EAST 45TH ST., NEW YORK 17, N. Y. • 8210 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF. • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA. • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Continental Motors Corporation
MUSKEGON, MICHIGAN

*Circle 18A on reply card*

# LATTICE BRAID* Packing

## *outlasts* ordinary packings

## $3\frac{1}{2}$ to 1 on Mine "Pole" Pumps

*Registered Trademark. *Only* Garlock makes LATTICE BRAID rod and shaft packings.

Reciprocating "pole" pumps handling gritty water underground in an iron mine are subjected to unusually severe service. That's why a prominent Lake Superior district mining company decided to try LATTICE BRAID Packing on their pumps in a mine in northern Wisconsin. Previous packings had never lasted over one month. This large mine now reports that LATTICE BRAID lasts 3½ months *and* that it causes *less* wear on the "poles" (plungers) than any other packing used.

Put Garlock LATTICE BRAID Packing to work for your company. All the braided strands of this unique packing are lattice linked together into one structural unit. The strands hold together even when the packing is worn far beyond the limits of wear of ordinary braided packings.

LATTICE BRAID is made from flax, cotton, asbestos, wire-inserted asbestos, Teflon, and asbestos with Teflon impregnation—for various types of services.

*Get all the facts about* LATTICE BRAID *Packings. Contact your Garlock representative or write for new folder AD-131.*

**THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK**

**Sales Offices and Warehouses:** Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N. Y.) • Philadelphia Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

**In Canada:** The Garlock Packing Company of Canada Ltd., Toronto, Ont.

**GARLOCK** LATTICE BRAID PACKING

*Circle 19A on reply card*


Thermal Research & Engineering Corporation is distributing Bulletin No. 107 on its high-velocity oil burners for furnaces, ovens, driers and kilns. It contains information on operating principles, capacities and applications.

*Circle 26E on reply card*

An indexed bulletin, SP-50, describes and illustrates Bellows air motors and valves, together with accessories. A 28-page book, it gives complete dimensional details in tabular form to facilitate their application to most any operation.

*Circle 27E on reply card*

A new reference file with catalogues describing the complete line of Morse cam clutches for indexing, overrunning and backstop application is now available. Also includes information on lubrication and deals with installation procedures.

*Circle 28E on reply card*

The Swartwout Company, manufacturer of process-control, power-plant and ventilating equipment, is offering Bulletin A-713 which describes in detail its Type P3T flush-diaphragm pressure transmitter. Data on operating principles are included, together with a dimensional diagram.

*Circle 29E on reply card*

Associated Valve & Engineering Company has available a catalogue on its Section "B" stainless-steel globe and stop valves of various types. Brochure contains several pages of engineering data such as decimal equivalents, weights and measures, as well as length, area, volume, pressure, velocity and discharge conversion tables.

*Circle 30E on reply card*

The Carborundum Company has published a brochure on its V40 line of toolroom grinding wheels available in straight, recessed, dish, saucer, and straight or flaring cup shapes. It includes helpful hints on tool conservation and a handy wall chart with recommendations for grinding high-speed tool and die steels.

*Circle 31E on reply card*

In Bulletin DM035 The Bristol Company lists and illustrates its complete line of recording automatic control and telemetering instruments and describes its new Metagraphic pneumatic transmission instruments by which measuring, recording and controlling are divided into three separate functions for maximum flexibility in service.

*Circle 32E on reply card*

A new general catalogue, No. 1, obtainable from Fischer & Porter Company, contains illustrations and descriptions of its complete line of process instruments for measuring and controlling process variables, including electric, pneumatic, and electronic transmitters, recorders and controllers with alarms and integrators and air-operated valves of different kinds and materials.

*Circle 33E on reply card*

A comprehensive book on *Cooling Water for Industry* is being offered by The Fluor Corporation, Ltd., which has been in the business for 35 years. Designated as CT-ID-0.002, it describes the construction and operation of induced-draft cooling towers and shows applications. It should be of particular interest to those with heat-dissipation problems.

*Circle 34E on reply card*

The Alloy Casting Institute has published a folder of thirteen data sheets describing the more popular grades of alloys used in making stainless-steel castings. Each lists chemical composition and physical and me-

chanical properties and indicates preferred heat treatment applications and design considerations. The American Society for Testing Materials, the Society of Automotive Engineers and other groups have co-operated in collecting the information, which is the culmination of a project that was started ten years ago.

*Circle 35E on reply card*

A file folder offered by Protective Closures Company, Inc., presents its full line of polyethylene threaded and nonthreaded caps and plugs for safeguarding products undergoing processing or during storage or transit. Designated as Caplugs, they are available for tubing, fittings, valves, hydraulic components, etc., in five standardized designs and more than 100 stocked sizes. Samples are available upon request.

*Circle 36E on reply card*

The second edition of *Drafting Standards —Aluminum Extruded and Tubular Products*, has been issued by The Aluminum Association. First published in 1949, the manual is timely in view of the great increase in the use of extruded products in recent years. Requests for copies must be made on company letterheads to The Aluminum Association, 420 Lexington Avenue, New York 17, N. Y.

Form CP2 deals with Thermo Instruments Company's new Belmont Level Control which serves as a link between capacitive-type electronic level-sensing equipment and pneumatic control valves or other devices used in handling most nonadhesive chemicals, milk, oils, refrigerants such as ammonia and Freons, and all condensed gases ranging in temperature from minus 425 to plus 500°F.

*Circle 37E on reply card*

Form 5300-A released by Ingersoll-Rand Company deals comprehensively with its full line of single-, double- and triple-drum air or electric hoists for handling bulk materials of all kinds. A 44-page catalogue, it describes and illustrates each type and size, as well as brakes, remote control and throttle equipment. Also included are tables giving weights of materials and rope pull required to draw cars upgrade. Many installation views in both industrial and mining fields are shown.

*Circle 38E on reply card*

The Tubular Exchanger Manufacturers Association has issued an Addendum to the third edition of the TEMA Standards for heat exchangers. The 1954 supplement covers all changes and additions that have been approved since that edition was published and supersedes the earlier corresponding paragraphs, tables and figures. Copies of the Addendum are being mailed free of charge to all holders of the TEMA 1952 Standards or can be obtained at $5.50 per copy from Tubular Exchanger Manufacturers Association, Inc., 53 Park Avenue, New York 7, N.Y.

Reinhold Publishing Corporation has announced that the thirty-ninth edition of its annual *Chemical Engineering Catalog* is ready for distribution. A copiously illustrated work of 1951 pages, it provides production men and chemical engineers with factual information on equipment and engineering materials used in the industry. (Chemicals and raw materials are covered separately in *Chemical Materials Catalog*.) For easy reference there are six indices listing company and trade names, functions, equipment and construction materials, plants and specialized services.

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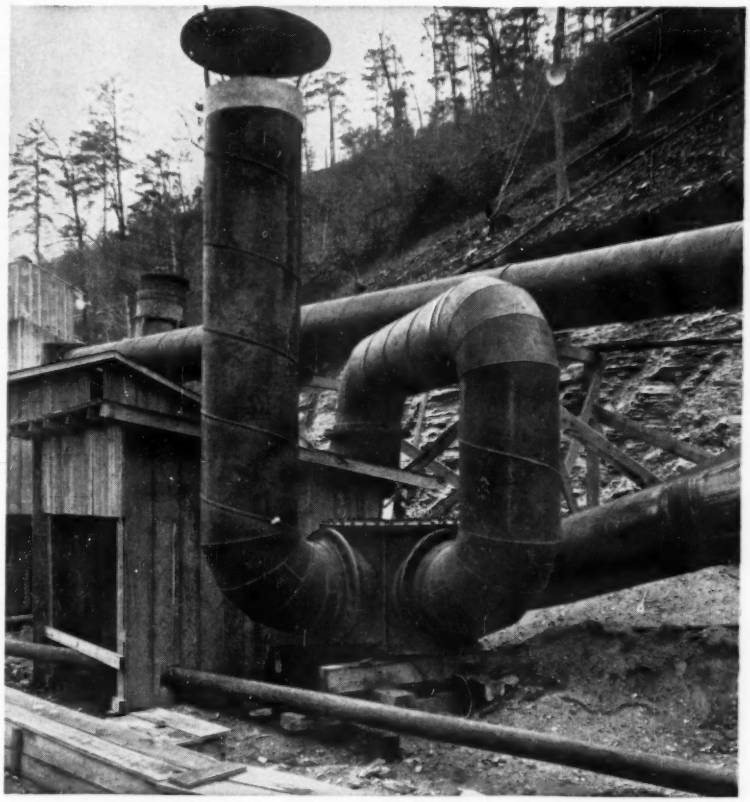
# MAN-MADE WEATHER for UNDERGROUND SERVICE



There's nothing more vital in underground construction than a dependable method for supplying fresh air and eliminating stale air, gases, fumes and dusts. That's where Naylor lightweight pipe comes in, providing the most dependable system for push-pull ventilation. Its light weight makes it easy to handle and install, particularly with the Naylor one-piece Wedge-Lock coupling to speed connection. Extra collapse strength and safety are assured through Naylor's exclusive lock-seamed spiralwelded structure which permits the use of lighter gauge steel without sacrificing strength. For full details on this outstanding pipe and coupling combination, write for Bulletins No. 507 and No. 514.

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NAYLOR PIPE COMPANY

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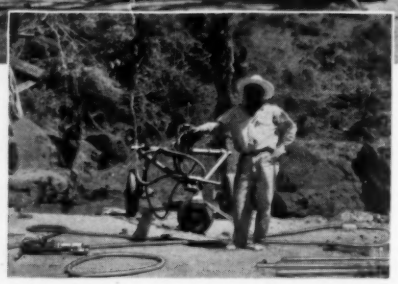
# In TROPICAL JUNGLES, too, GYRO-FLO means dependable air power

GYRO-FLO 315 cfm portable compressor on location near Laguna de Güija dam site, El Salvador. In this remote and isolated spot, GYRO-FLO's exceptional freedom from maintenance has been an important advantage.



A JHM Wagon Drill and three J-50 Jackdrills form the "business end" of this I-R Contractors' Combination—averaging 1200 feet per bit with Series 115 Carsets in hard abrasive basalt.

HERE, in the tropical jungle of Central America, an I-R Contractors' Combination is helping to dam the outlet of Lake Güija. Consisting of a 315 cfm GYRO-FLO portable compressor, JHM wagon drill and three J-50 Jackhamers, this combination is being used by Padilla-Cuéllar, contractors, for removal of 100,000 cubic meters of rock and the building of a 12 meter by 60 meter dam—part of a large hydro-electric project under the Comisión Ejercitiva del Río Lempa.

Drilling in hard abrasive basalt, with Series 115 Carset Jackbits, they have averaged 1200 feet per bit. And the 315 cfm GYRO-FLO rotary compressor has lived up to its reputation for smooth, trouble-free performance. On a job like this, where major service facilities are far away, *dependability* is a mighty big asset!

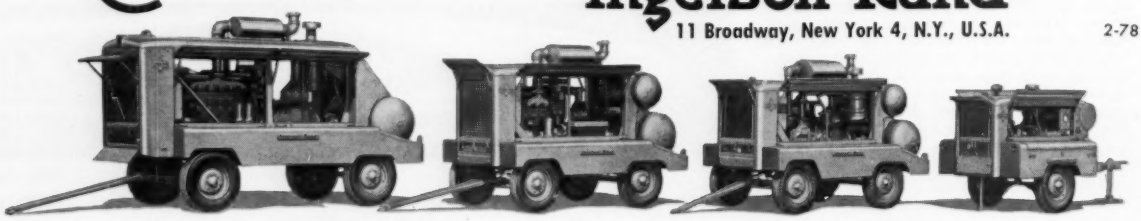
Plan now to take advantage of a GYRO-FLO on *your* next construction job. They're available in 125, 210, 315 and 600 cfm sizes. Ask your I-R representative for complete details.

I-R CONTRACTORS' COMBINATION

**Ingersoll-Rand**

11 Broadway, New York 4, N.Y., U.S.A.

2-78



# New Cooling Control

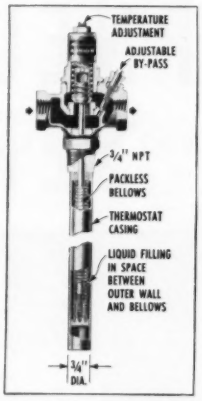
▲ *Inexpensive*
▲ *Dependable*
▲ *Compact*

Here is a new Sarco Cooling Controller that is inexpensive (less than $40) and fills the need for a compact self-powered control with dependable performance.

Check these features: Compact—overall height of the ¾" size is only 17⅝". Self-powered—requires no electrical or compressed air hook-up. Single seated valve not affected by silt or scale-forming minerals. No packing to wear or leak. Thermostat provides powerful throttling action. Adjustable temperature ranges from 40° to 200°F.

For complete details call your Sarco representative, or write:

**SARCO COMPANY, Inc.**
Empire State Building, N. Y. 1, N. Y.
2106F




**SARCO T-44**

Designers and users of water-cooled equipment find this controller well suited for hundreds of applications such as:

Compressors
Small engines
Oil coolers
Rolls
Solvent coolers
Small condensers
Water cooled bearings
Dry cleaning stills

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**COMPLETE RANGE IN 1 CONTROL UNIT**

Either 20 to 180 or 25 to 250 PSI.
No spring changes required.

**MORE AIR CAPACITY**
with improved 2-way ball and "O" ring type valve.

*Write for Bulletin 9013A. Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin*

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

**SQUARE D COMPANY**

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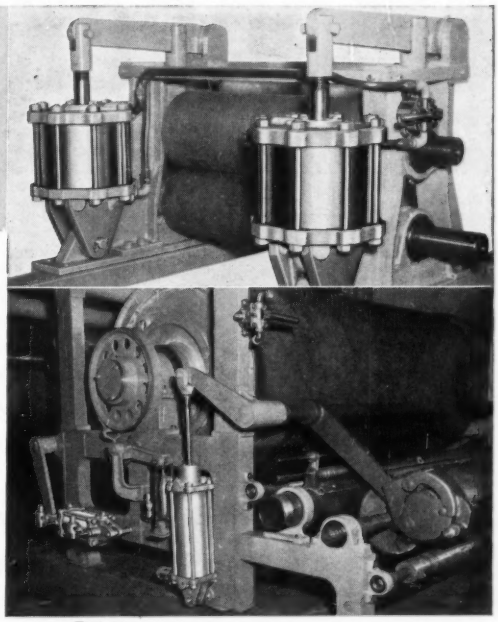
# CLOTH-FINISHING MACHINES ...employ NOPAK Cylinders to Raise and Lower Rollers



The David Gessner Company, Worcester, Mass., manufacturers of modern cloth finishing equipment, employs NOPAK Air Cylinders in its sizing machines to raise and lower heavy rollers, and, in some cases, to equalize roller pressures. The examples pictured may suggest how you, too, can use NOPAK Cylinders, controlled by NOPAK Operating Valves, to build accurate, simplified machine movements into your plant equipment, or into machinery that you manufacture for resale.

The NOPAK Application Manual shows you how NOPAK Valves and Cylinders are being used in all types of industry, in many types of machinery and equipment for pulling, pushing, lifting, lowering, clamping, positioning. If you haven't seen a copy, ask your NOPAK representative, or write.

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**NOPAK**
**VALVES AND CYLINDERS**
**DESIGNED for AIR and HYDRAULIC SERVICE**



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# *Use This Hose...*
## FOR YOUR TOUGHEST DRILLING JOBS!

# "HARDROK"
## *Wire Braid* AIR HOSE

Assurance of longer service life, with consequently lower replacement costs, recommends "HARDROK" wherever severest drilling conditions call for a truly **super-strong** air hose.

The carcass is made of horizontally braided steel wires, providing exceptional strength, durability and resistance to kinking, without impairing flexibility. The long-lasting Synplastic tube is impervious to the action of oil from the drill. The cover is a tough, wear-resistant yellow rubber compound. A black spiral stripe gives the hose a distinctive appearance for easy identification. Sizes ½" to 2", inclusive.

*Contact Our Nearest Branch for Details and Prices*

**GOODALL RUBBER COMPANY**

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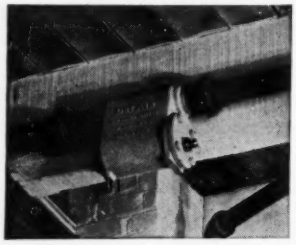
Est. 1870

# DEPENDABLE PNEUMATIC SERVICE

## WHEN EQUIPMENT IS PROTECTED BY
# DRIAIR
## A COMPLETE SELF-CONTAINED UNIT



DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

**DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper — resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.**

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**PROVED BY YEARS OF USE IN THOUSANDS OF APPLICATIONS**

For more than 25 years—in applications ranging from motion picture projectors to bulldozers—the amazing properties of **BEARIUM METAL** have greatly reduced operating costs and solved countless frictional problems everywhere.

Non-seizing and non-scoring—even should lubrication completely fail—**BEARIUM METAL** provides not only every desirable quality found in other bearing alloys, but possesses features in addition that are *exclusive*.

*The Ultimate Development for Bearing Services*

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*Write for full information on this amazingly different bearing bronze.*

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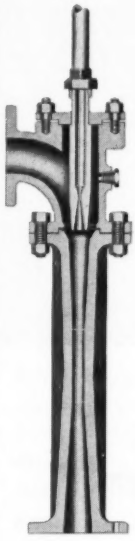
Do you have a

# VACUUM PROBLEM?

## Solve it with a simple, economical I-R EJECTOR



It's surprising how many vacuum problems can be solved by I-R steam-jet ejectors. Often these simple, economical devices can utilize steam that would otherwise be wasted, thus saving the cost of more elaborate vacuum equipment.

Your nearest Ingersoll-Rand branch office or representative will be glad to help you determine the size and construction best suited to your operating conditions. Write us for Bulletin 9013-A. 4-135

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PUMPS • COMPRESSORS • TURBO-BLOWERS • VACUUM EQUIPMENT
AIR & ELECTRIC TOOLS • GAS & DIESEL ENGINES

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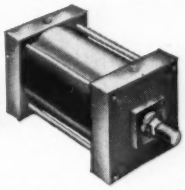
# EVERY ENGINEER

**will want a copy of this BULLETIN**



**WRITE FOR BULLETIN 213.** Complete details and mounting dimensions on Hannifin Series "A" Square Type Fluid Power Cylinders, usable up to 200 psi, air or oil. This is the cylinder with the new, externally removable cartridge gland...the biggest improvement in cylinder design in the last 50 years. The "A" line is complete! 11 bore sizes from 1½" to 14"—13 standard mountings, many combinations. Steel heads. Brass bodies. Piston rods ground, polished and hard chrome plated. Send for Bulletin 213. It's the easiest catalog to use in the cylinder business.

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**Air and Hydraulic Cylinders • Presses • Air Control Valves**

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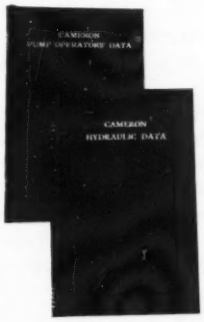



# TWO HANDY REFERENCE BOOKS

**for**

**THE ENGINEER, THE SUPERINTENDENT, THE OPERATING MAN**

CAMERON PUMP OPERATORS' DATA (Second Edition): Contains practical information covering the installation, operation and maintenance of centrifugal pumps.

CAMERON HYDRAULIC DATA (Twelfth Edition): Covers data useful in work involving the handling of liquids, steam, and water vapors.

Cameron Pump Operator's Data.....$2.00
Cameron Hydraulic Data.....$3.00

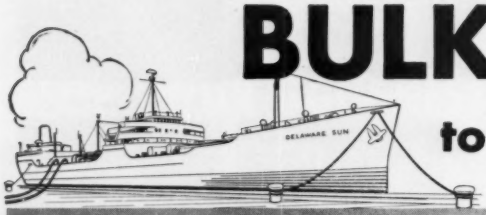
**Both books can be obtained at the combination price of $4.50.**

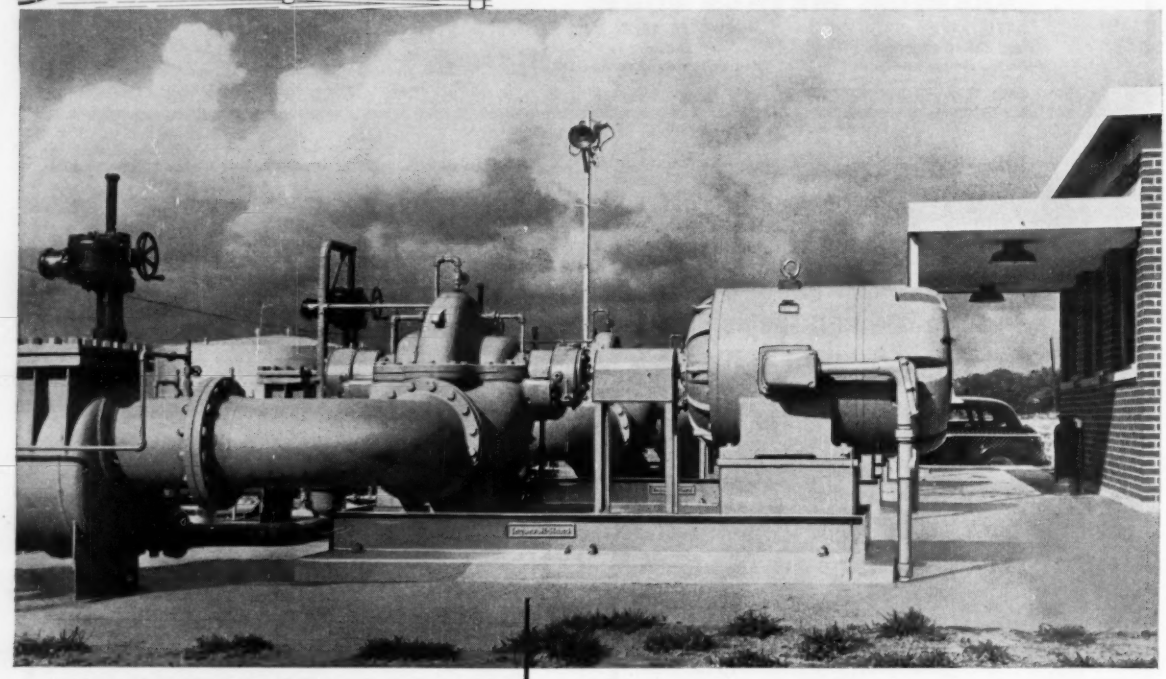
**COMPRESSED AIR MAGAZINE, 942 MEMORIAL PARKWAY**
**Phillipsburg, New Jersey, U.S.A.**

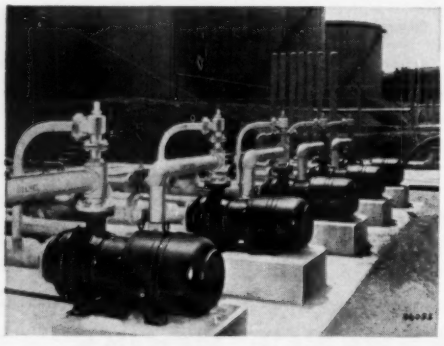
# Ingersoll-Rand Pumps help speed

# BULK LOADING

## to reduce tanker "tie-up" time





I-R close-coupled Motorpumps, like those shown above, are also widely used in smaller bulk loading stations. But whatever the size, Ingersoll-Rand centrifugal pumps have the inherent *stamina* that means dependable performance year after year.

## 3 Ingersoll-Rand ALV pumps at Sun Oil's "Sun Station" have combined capacity of 16,800 gpm.

Loading time is an important factor in the efficient operation of Sun Oil Company's tanker fleet. Hence the trend to high capacity in pumping station facilities—as illustrated by the large Ingersoll-Rand loading pumps shown above at "Sun Station" in Beaumont, Texas. Each of these pumps is designed for 5600 gpm at 134′ total head. Powered by 200 hp motors, they handle various grades of crude oil—for tanker loading and tank transfer service.

The entire operation of this tank station is designed for remote control from the modern, air-conditioned control room at the right in the photo above.

In tanker *unloading* too, I-R pumps have helped Sun Oil to set speed records. The S.S. Delaware Sun, for example, unloaded 213,000 bbl in 12 hours with three 4100 gpm Ingersoll-Rand HLV main cargo pumps.

Your I-R pump specialist will gladly discuss your requirements—and help you select the most efficient and economical pumping units for any type of installation.

**Ingersoll-Rand**

Cameron Pump Division

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COMPRESSORS • TURBO-BLOWERS • PUMPS • GAS & DIESEL ENGINES • AIR & ELECTRIC TOOLS • VACUUM EQUIPMENT



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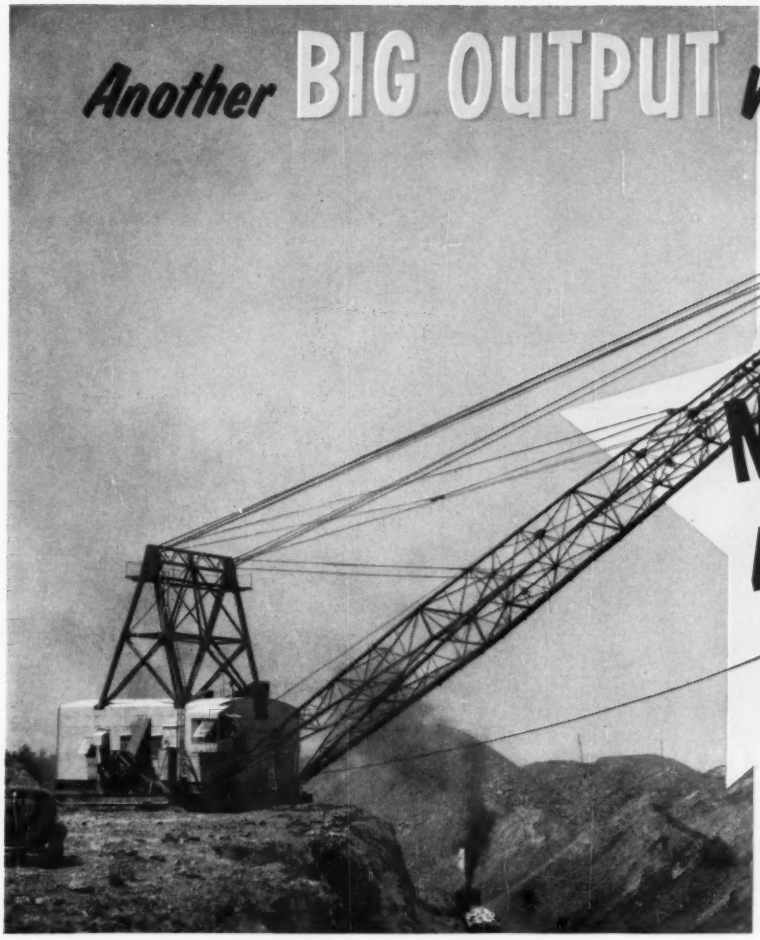
# Another BIG OUTPUT Walking Dragline



## MODEL 400-W

## 7-to 9-cu. yd. capacity

*Here's big news for men engaged in strip mining or heavy-duty construction work — Bucyrus-Erie has added another big-yardage, all-weather dragline to its world-famed "walker" line. You'll find unequalled money-making features in the new 400-W . . . here are some of them.*

**THREE POWER COMBINATIONS** — Your choice of heavy-duty diesel engine, electric power with independent motor-driven drums, and electric power with clutch-operated drums.

**EFFICIENT FRONT END** — All-welded boom has T-section chord members with tubular bracing for maximum strength, minimum deadweight. Fast filling, clean carrying, quick dumping buckets help assure big output.

**LONG WORKING RANGE** — Without throwing bucket, material can be moved 405 feet with the 400-W's 200-ft. boom and 7-yd. bucket, 377 feet with the 185-ft. boom and 8-yd. bucket, and 351 feet with the 170-ft. boom and 9-yd. bucket. Digging depths range up to 135 feet.

**RAPID OPERATING CYCLE** — Fast hoisting and lowering with powerful air-controlled clutches and brakes . . . rapid acceleration and deceleration of the swing under variable-voltage Ward Leonard control.

**EXCEPTIONAL MANEUVERING ABILITY** — With exclusive Bucyrus-Erie walking mechanism, the 400-W walks where you want it, when you want it, in good weather or bad, even on ground that's too soft for other machines.

**STRONG RIGID BASE** — Provides 748 sq. ft. of bearing area for full stability in working and walking.

**STURDY MAIN MACHINERY** — Is simple in design . . . is arranged for accessibility in servicing and maintenance, and for maximum counterbalancing effect . . . is rigidly held in accurate alignment on deep-section revolving frame.

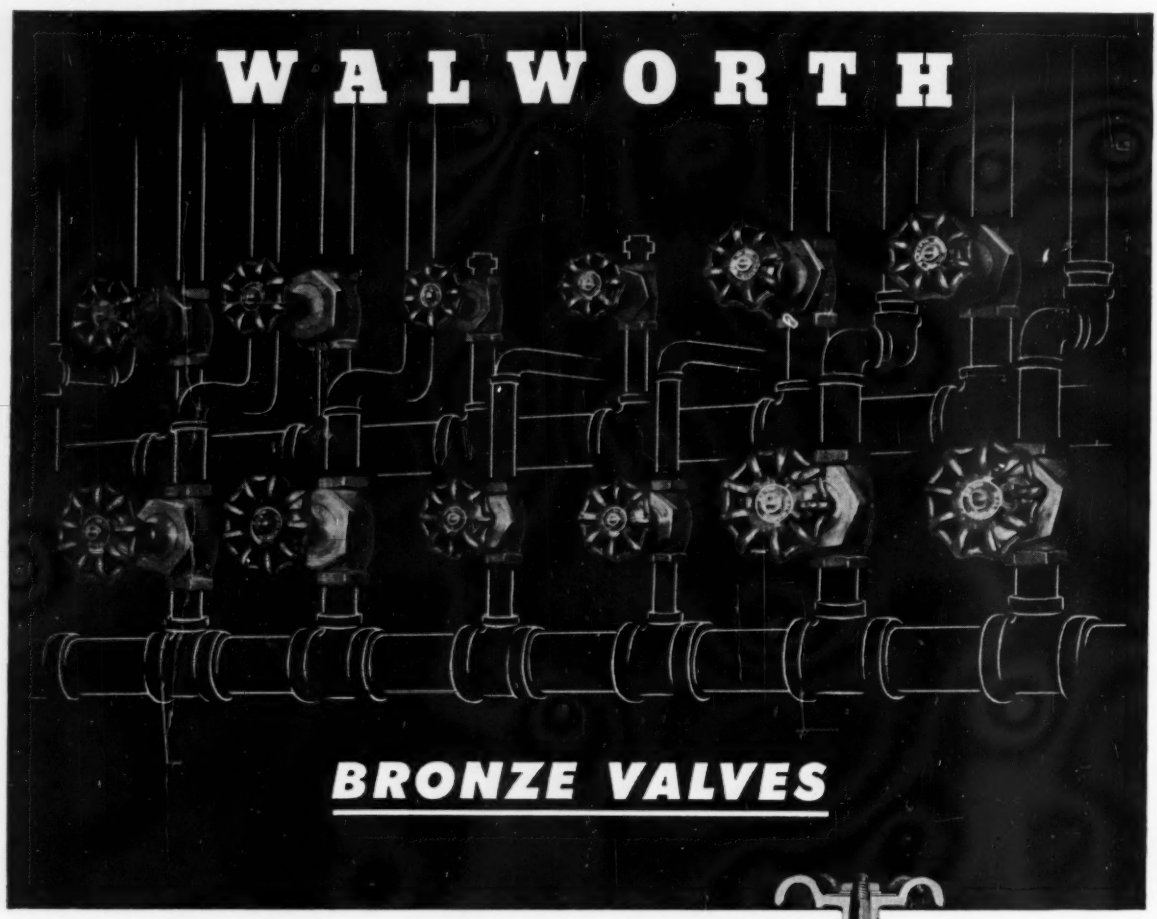
*Complete information is yours for the asking — write today!*

25L54C

BUCYRUS ERIE

**South Milwaukee, Wisconsin**

# WALWORTH

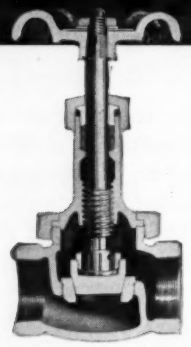


## BRONZE VALVES

*Better because* ... **Walworth has standardized its line of bronze valves to provide an unsurpassed system of interchangeability of parts for assembly or replacement. You can maintain a great number of Walworth Bronze Valves with a small inventory of basic parts . . . you minimize part replacement problems. For further information, ask us for our Bronze Valve Standardization Chart.**

Choose from complete lines of Walworth Bronze Valves – including gate, globe, angle, check, and lubricated plug types. Walseal® Bronze Valves and Fittings are also available for making silver-brazed joints.

For full information on Walworth Bronze Valves and Fittings, call your Walworth Distributor, nearest Walworth Sales Office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



**Parts are carefully machined and finished to close tolerances, thereby assuring accurate fit and alignment under all conditions. Sectioned valve is Walworth No. 225P *Bronze* Globe Valve with stainless steel plug-type seat and disc, heat-treated to a minimum of 500 Brinell hardness.**

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*Manufacturers since 1842*

**valves . . . pipe fittings . . . pipe wrenches**

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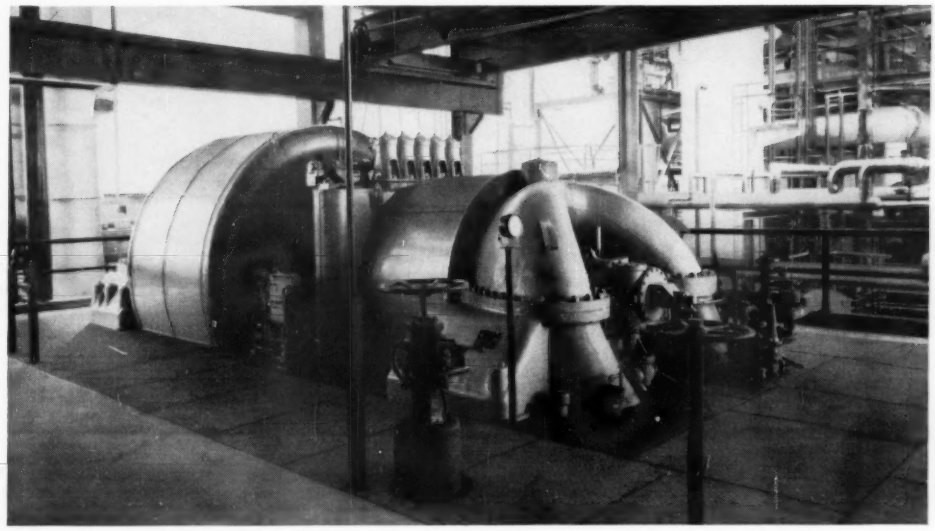
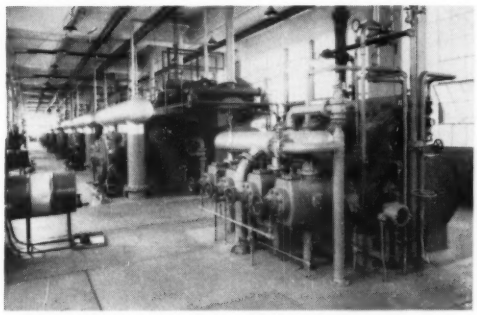


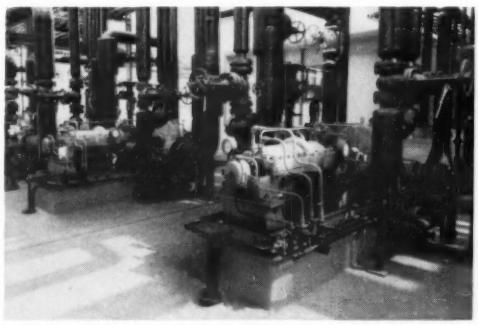
Ingersoll-Rand 108,000 cfm cat cracking blower installed at the Watson refinery. Unit is driven by a 9800-hp I-R steam turbine.

*huge Ingersoll-Rand turbo-blower serves new cat cracking plant*

# at Richfield's Watson Refinery



A battery of Ingersoll-Rand KVG and JVG 4-cycle V-angle gas-engine-driven compressors installed at Richfield's Watson refinery.



At the Watson refinery, the major portion of all the liquid-moving jobs is handled by Ingersoll-Rand pumps, such as the two I-R class CNTA pumps shown here.

The large-scale expansion and modernization program at the Richfield Oil Corporation's refinery at Watson, California, marks another milestone in Richfield's progress in petroleum production and refining.

Of significant importance in Richfield's plans for increased production and more efficient operation was the completion, in the summer of 1954, of a new fluid catalytic cracking plant. This new unit, which has a capacity of 63,000 barrels per day, is served by an Ingersoll-Rand turbo-blower rated at 108,000 cubic feet per minute, 22-psig pressure. The blower is driven by a 9800-hp I-R steam turbine that operates on 600-psig steam pressure, 750° F.

Ingersoll-Rand pumps, compressors and air ejectors also figure in these newly expanded and modernized Richfield facilities. But the Ingersoll-Rand trademark is no newcomer to the Watson refinery. I-R equipment has been in service there since the refinery first went on stream in 1923.

And in refineries everywhere, when dependability and economy of operation are important considerations, you'll find Ingersoll-Rand equipment.

12-139

**Ingersoll-Rand**

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

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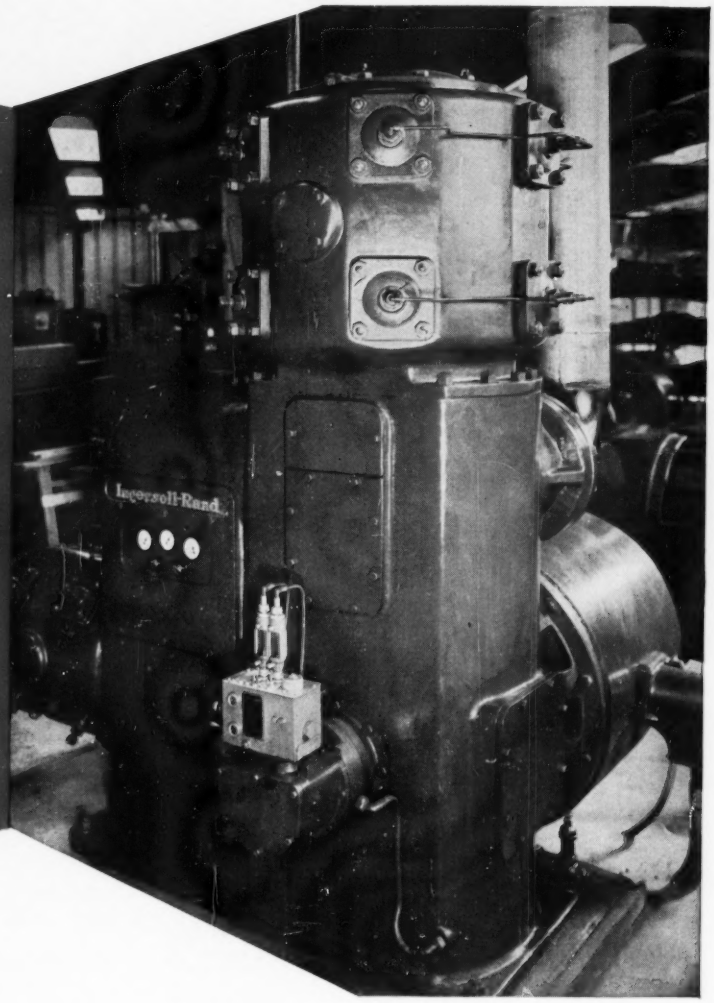
# AIR TODAY ...and not gone tomorrow




**YOU CAN** count on day-in, day-out trouble-free performance from your air compressors when you lubricate with *Texaco Regal Oil R&O*. For these reasons—

*Texaco Regal Oil R&O* is premium quality, especially refined and processed so that it 1) keeps rings free and efficient; 2) prevents valve deposits; and 3) keeps lines and systems clean and free from rust.

There is a complete line of *Texaco Regal Oils R&O* to assure top efficiency and rock bottom maintenance costs regardless of the size or type of compressor, the number of stages or pressure involved, or the operating conditions.

Let a Texaco Lubrication Engineer help you select the proper one. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO REG. T.M.

## TEXACO Regal Oils R&O

**FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS**

**TUNE IN:** TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE, on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

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